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EXPERIENCE OF SOVIET MEDICINE IN A GREAT PATRIOTIC WAR, 1941-19--ETC(U)

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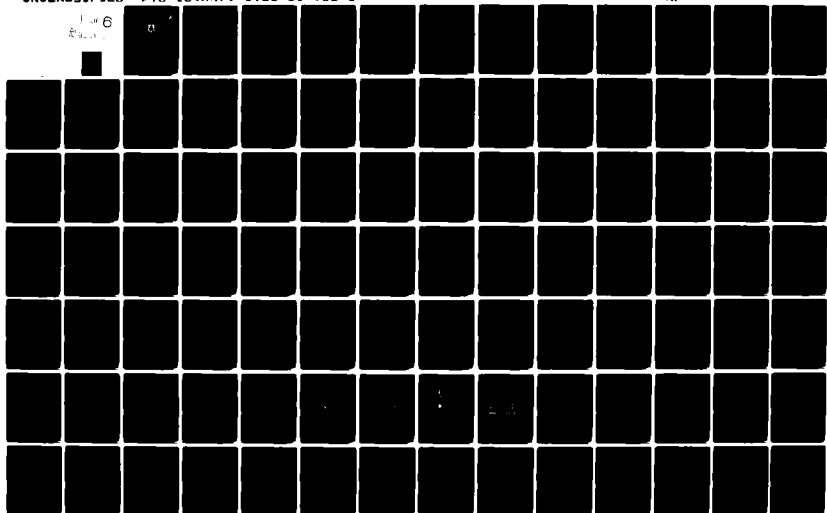
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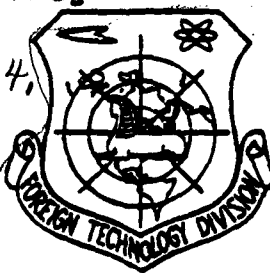
(6) EXPERIENCE OF SOVIET MEDICINE IN A GREAT  
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already developing osteomyelitis was very importantly (table 228).

In the relation to injured people without osteomyelitis therapeutic immobilization, thus, was applied within the earlier periods and in the more foremost stages than in the group of injured people with osteomyelitis. However, from this it does not follow that osteomyelitis appeared as a result of the delay with the use/application of therapeutic immobilization or that the presence of osteomyelitis caused delay in the use/application of therapeutic immobilization, since among the injured people without osteomyelitis there was a considerable number of those amputated during the first days after injury and it is more persons with the light breaks, than among the injured people with osteomyelitis; injured people with the light break usually earlier than others obtained therapeutic immobilization, and those amputated a strict immobilization not at all required.

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Table 228. The distribution of injured people with bullet break of bone shin, complicated and not complicated osteomyelitis, in the periods of the use/application of the first treatment immobilization and the stages of the evacuation where it was applied (in the percentages).

(1) Группа раненых	(2) Сроки (в сутках)			(3) Этапы эвакуации		
	10	11-20	(4) 21 и более	(5) армейский район	(6) фронт-овой район	(7) тыловой район
С остеомиелитом . . . (8) . .	56,7	25,1	18,2	58,3	38,5	5,2
Без остеомиелита . . . (9) . .	65,5	21,8	12,7	61,0	34,1	4,9

Key: (1). Group of injured people. (2). Period (a day). (3). Stage of evacuation. (4). and more. (5). army region. (6). front region. (7). back region. (8). With osteomyelitis. (9). Without osteomyelitis.

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The same explains the character/nature of the therapeutic immobilization, applied in the same groups (Table 229).

In injured people with osteomyelitis the more advanced immobilization was applied more frequent than in injured people without osteomyelitis, which was it very expediently and corresponded to the characteristic of these groups of injured people given above in the relation to the form/species of break and time of amputations.



Physiotherapy and therapeutic gymnastics with bullet osteomyelitis of the bones of shin were applied frequently (table 230).

In injured people with bullet osteomyelitis therapeutic gymnastics in combination with the physiotherapy, and also without the combination with it found larger use/application (79.40/o), than in injured people without this complication (66.30/o). This was caused by the more frequent complication of contracture in injured people with bullet osteomyelitis of the bones of shin in comparison with the injured people without osteomyelitis.

By the most widely used form/species of physiotherapy with osteomyelitis of the bones of shin was illumination quartz lamp and warming with sun lamp. Extensively were used application of paraffin, mud/contamination, peat and clay.

Physiotherapy exerted favorable influence and it contributed to the liquidation of osteomyelitis of the bones of shin.

Irradiation by quartz lamp contributed to an increase in the general/common/total tone of organism, its resistivity and immunobiologic properties and improved the trophic system of tissues.

Table 229. Distribution of injured people with bullet break of the bones of shin, complicated and not complicated osteomyelitis, according to the character/nature applied therapeutic immobilization (in the percentages).

(1) Группа раненых	(2) Характер иммобилизации	(3) Гипсовая или другая шина	(4) Глухая гипсовая повязка	(5) Скелетное вытяжение	(6) Прочие виды	(7) Всего
С остеомиелитом . . . (8) . .		21,1	78,9	0,5	1,5	100,0
Без остеомиелита . . . (9) . .		49,2	48,3	0,1	2,4	100,0

Key: (1). Group of injured people. (2). Character/nature of immobilization. (3). Gypsum or other splint. (4). Anechoic gypsum bandage. (5). Skeletal/skeleton stretching. (6). Other forms/species. (7). In all. (8). With osteomyelitis. (9). Without osteomyelitis.

Table 230. Physical and medicinal methods of treatment in injured people with bullet break of the bones of shin, complicated and not complicated osteomyelitis (in the percentages).

(1) Группа раненых	(2) Вид лечения	(3) Физиотерапия, лечебная гимнастика и медикаментозное лечение	(4) Лечебная гимнастика	(5) Только медикаментозное лечение	(6) Всего
С остеомиелитом . . . (7) . . . . .		61,9	17,5	20,6	100,0
Без остеомиелита . . . (8) . . . . .		50,1	16,2	33,7	100,0

Key: (1). Group of injured people. (2). Form/species of treatment. (3). Physiotherapy, therapeutic gymnastics and medicinal/medicamentous treatment. (4). Therapeutic gymnastics. (5).

Only medicinal/medicamentous treatment. (6). In all. (7). With osteomyelitis. (8). Without osteomyelitis.

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Favorably influenced mud application. They acted on the local pathological process soothing, was caused active hyperemia of tissues, contributed to the resorption of infiltrates and remainders/residues hemorrhages into the soft tissues, helped resorption and coming out of fine/small sequestrations, they accelerated and improved regenerative processes in the bone tissue.

Metered therapeutic exercise and ergotherapy were conducted for dealing with the limitation of the mobility of knee and talocrural joint, with atrophy and inactivity of muscular groups both sick and healthy/sound extremity.

Only contraindication to the use/application of therapeutic gymnastics was sharp depletion as a result of the prolonged course of wound process and its septic character/nature. After the liquidation of these phenomena the therapeutic exercise was renewed.

The blood transfusion with bullet osteomyelitis of the bones of shin was conducted for elevating the general/common/total tone of

organism and increase in its immunobiologic properties. It was produced in 27.4o/o of injured people, furthermore, in 4.2o/o of injured people with osteomyelitis of the bones of shin was made the transfusion of the blood replacing fluids/liquids.

In the half all injured people were applied the repeated transfusions of the small doses of the blood (200 ml).

A great number of blood transfusions with osteomyelitis of the bones of shin is produced in the back evacuation hospitals where in essence was conducted fight with osteomyelitis (Table 231).

In the group of the injured people, who did not have osteomyelitis, the bulk of transfusions was produced in the army and army region. This is explained by the fact that in these regions was observed bulk of the severe complications which the injured people without osteomyelitis had several times more than in injured people with osteomyelitis. In connection with this the total number of persons, which produced the blood transfusion, in this group of the injured people, who did not have osteomyelitis, was more (31.5o/o), than in the group of injured people with osteomyelitis (27.4o/o).

Table 231. The distribution of injured people with bullet break of the bones of shin, complicated by osteomyelitis and by not complicated by them, in the stages of evacuations, in which was transfused the blood (in the percentages).

(1) Группа раненых	(2) Этап эвакуации		ЭГ			(3) На разных этапах	(4) Про- чие	(5) Всего	(6) Перели- вания не произво- дилось
	ДМП	ППГ	(7) армии	(8) фронта	(9) тыла				
С остеомиелитом (10)	6,4	8,4	5,2	18,6	40,4				
Без остеомиелита (11)	21,2	18,5	8,1	12,0	10,8				

Key: (1). Group of injured people. (2). Stage of evacuation. (3). In different stages. (4). Other. (5). In all. (6). Transfusions was not conducted. (7). army. (8). front. (9). rear. (10). With osteomyelitis. (11). Without osteomyelitis.

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#### Prophylaxis.

In 15 volume of "work" (pg. 141, 144, etc.) are presented the materials on the realization during the war of the measures, directed toward warning/prevention of the complications of the bullet breaks of the bones of shin. Thus, a number of injured people, who obtained first aid for the first hour after injury, increased with 61.40/o during the first year of war to 78.50/o into the fourth; a number of

injured people, who obtained primary surgical processing, within the time of war increased more than 1 1/2 times; the periods of primary processing with each year of war were shortened, for example, in the immediate 12 hours after injury during the first year of war are processed 28.10/o, and into the fourth - 48.60/o; by the stage of primary surgical processing all more frequently became DMP (52.80/o in 1941 and 83.50/o in 1945). The character/nature of primary surgical processing within the time of war also changed: a number of dissections with the carving was shortened from 62.9 to 51.10/o, and a number of processings of bone wound increased from 15.5 to 20.30/o; in the relation to therapeutic immobilization occurred these shifts/shears: during the first ten days from the day of injury it was applied during the first year of war in 54.60/o of injured people, and in the fourth - in 75.70/o; therapeutic immobilization was applied in the army region during the first year of war in 44.40/o, and in the fourth - in 63.30/o, etc.

Were used extensively sulfanilamide preparations both vnutr6 and it is local.

Thus, within the time of war aid by injured person with the bullet break of the bones of snin, it is doubtless, was improved.

In parallel with this during the war occurred the increase of

the following unfavorable moments/torques: increased a number of fragmentation injuries from 50.5 to 59.3o/o, a number of injured people with the foreign bodies - from 33.2 to 35.7o/o and with the associated injuries - from 16.3 to 27.8o/o. Changes in the character/nature of breaks within the time of war were such, that a quantity of fragmented breaks which most of all gave the complications of osteomyelitis, not only did not increase, but even it decreased (Table 232).

There is no doubt that all enumerated measures for prophylaxis of complications, and also of change in the relation to a quantity of fragmentation injuries, injuries with the foreign bodies and quantities of different breaks within the time of war to a considerable degree touched the group of injured people whose break was complicated by osteomyelitis, since a number of such injured people composed 41.8o/o of all injured people with the break of the bones of shin.

Taking into account the considerable strengthening of preventive measures, and also the decrease of fragmented breaks for the time of war, it was possible to expect reduction in the quantity of the complications of osteomyelitis on the years of war. In actuality was observed the increase of a number of complications of osteomyelitis to 1943, and subsequently stabilization on the higher indicators than in 1941 and 1942 (1941 - 34.3o/o, 1942 - 39.8o/o, 1943 - 44.7o/o, 1944 - 42.4o/o, 1945 - 42.5o/o).

Table 232. Distribution of the bullet breaks of the bones of shin according to the form/species of the break during the different years of war (in the percentages).

(1) Годы	(2) Вид перелома	(3) Дырчатый и краевой	(4) Оскольча- тый	(5) Раздроблен- ный	(6) Прочие	(7) Всего
Первый . . . . .	(8) . . . . .	15,9	48,7	19,9	15,5	100,0
Второй . . . . .	(9) . . . . .	20,6	45,5	22,7	11,2	100,0
Третий . . . . .	(10) . . . . .	25,4	40,7	22,6	11,3	100,0
Четвертый . . . . .	(11) . . . . .	25,7	39,1	24,2	11,0	100,0

Ключ: (1). Years. (2). Form/species of break. (3). Perforated and edge/boundary. (4). Fragmented. (5). Crushed. (6). Other. (7). In all. (8). first. (9). The second. (10). The third. (11). The fourth.

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Although it is very difficult to determine the role of each of the factors given above individually in the matter of prophylaxis of the complication of osteomyelitis, nevertheless it is possible to say that the expanded primary surgical processing under conditions DMP in the relation to prophylaxis of the complications of osteomyelitis was insufficient effective.

At the same time should be focused attention on the fact that a quantity of the complications of osteomyelitis grew/rose each year of war in parallel with an increase in the number of crushed, and also



perforated and edge/boundary breaks (Table 232), i.e., such breaks which less anything gave the complications of osteomyelitis.

Consequently, an increase in the quantity of the complications of osteomyelitis in the years of war occurred also due to the refinement of the diagnosis of osteomyelitis, which complicated most the lungs and the heaviest breaks of the bones of shin.

#### Issues.

The issues of the breaks of the bones of shin, complicated by osteomyelitis, it is necessary to examine from two point of view: recoveries from osteomyelitis and general/common/total recovery of injured person with the extraction from the hospital, since known numerous observations when available osteomyelitis up to the moment/torque of the extraction of injured person from the hospital was not cured, but injured person was completely able-bodied, or when after the liquidation of osteomyelitis remained the such heavy consequences of injury, that the injured person became invalid.

It is first of all necessary to dwell on the question about the consolidation of break in connection with the complication of osteomyelitis.

In the majority of the injured, suffered bullet osteomyelitis

bones of shin, the consolidation began considerably earlier than was finished inflammatory process in the bone and in the soft tissues.

Fairly often the injured person could be moved without the crutches, having nonhealing wound of soft tissues or already formed fistula which detained it in the hospital for a prolonged time.

According to the data of the development of the histories of disease/sickness/illness/malady, the formation of the callus in the group of injured people with osteomyelitis and in the group of injured people, having of this complication, occurred within the following periods, given in Table 233.

Consequently, the presence of osteomyelitis to a considerable degree detained the formation of bone with the bullet breaks of the bones of shin, on the average by 1.1 months.

Table 233. Periods of the formation of the callus in injured people with the bullet break of the bones of shin, complicated and not complicated by osteomyelitis (in the percentages).

(1) / (2) Сроки (в месяцах)	(3) Три и ранее	(4) Четыре и пять	(5) Шесть и более	(6) Всего	(7) Мозоль не образовалась совсем	(8) Средний срок (в месяцах)
Группа раненых						
С остеомиелитом . (9)	52,5	37,3	10,2	100,0	5,4	3,2
Без остеомиелита . (10)	85,9	12,7	1,4	100,0	1,1	2,1

Key: (1). Group of injured people. (2). Period (in months). (3). Three are earlier. (4). four and five. (5). Six and more. (6). In all. (7). Corn was not formed at all. (8). Average period (in months). (9). With osteomyelitis. (10). Without osteomyelitis.

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Nonaccretion of the bones of shin in the presence of osteomyelitis was observed almost 5 times more frequently than in the absence of it. It is known that a great number of pseudoarthroses gave the crushed breaks which in the group of injured people with osteomyelitis it was only 12.60/o, while in the group without their osteomyelitis there were 32.60/o (Table 211, pg. 316). These data very clearly show the inhibiting effect of osteomyelitis on the formation of bone. In some injured people this effect can be considered indirect, when the treatment of osteomyelitis was

conducted by cross subperiosteal resection.

As a rule, the callus, which is generated after the bullet break of the bones of shin, was to the sufficient degree strong/firm; therefore the repeated (pathologic) fracture in the region of corn was observed rarely. Based on materials of I. L. Glezer, this was noted into 0.60/o.

The frequency of the recovery of bullet osteomyelitis to a considerable degree oscillated depending on varied conditions. In injured people during the different years of war the percentage of the recovery of osteomyelitis was not identical (Table 234).

Osteomyelitis of fibular bone was cured in the larger percentage than tibial one or both bones simultaneously, with break of which the severity of trauma was almost always more considerable, rather than with the break of fibular bone.

From Table 234 it is evident that for the time of war the greatest successes were achieved in the treatment of osteomyelitis of both bones (in 1941 - 28.30/o, and in 1944 - 50.30/o) and smallest - in the treatment of osteomyelitis of fibular bone (66.70/o in 1941 and 81.90/o in 1944). This is explained by the more frequent use/application of sequestrectomy with osteomyelitis of both of bones

and one tibia.

During the Great Patriotic War the most ideal method of the treatment of bullet osteomyelitis was considered sequestrectomy; however depending on different conditions were applied other methods: conservative treatment or operation/process only on the soft tissues. These methods gave the identical percentage of the recovery of osteomyelitis. It is very important to note that the percentage of the recovery of osteomyelitis after the use/application of each of these methods of treatment was increased with each year of war (Table 235).

It is evident from Table 235, a great increase in the percentage of recovery relates to the injured people, who were subjected to operation/process only on the soft tissues (1941 -25.7o/o, 1944 -64.4o/o), and small - to the cases after operations/processes on the bones (1941 -48.0o/o, 1945 -55.0o/o).

Table 234. Frequency of the recovery of bullet osteomyelitis of the bones of shin during the different years of war (in the percentages).

(1) Локализация остеомиелита	(2) Годы						(3) В среднем
		1941	1942	1943	1944	1945	
Малоберцовая кость (4)		66,7	67,4	73,3	81,9	66,6	73,2
Большеберцовая кость (5)		35,1	49,4	55,7	48,0	55,8	50,9
Обе кости (6)		28,3	36,0	40,5	50,3	48,1	43,2
В среднем (7)		39,1	48,8	55,3	54,5	56,9	53,2

Key: (1). Localization of osteomyelitis. (2). Years. (3). On the average. (4). Fibular bone. (5). Tibia. (6). Both bones. (7). On the average.

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This is completely logical, since benign flowed/occurred/lasted bullet osteomyelitis related mainly to the group of injured people, whose operations/processes on the bone it was not conducted. Furthermore, with each year of war all less and less than injured people with osteomyelitis was treated conservatively or by operation/process only on the soft tissues (table 220), and consequently, occurred the more careful selection of injured people for the conservative treatment and for palliative operation/process, in consequence of which was noted a considerable increase of the percentage of recovery in these groups of injured people in

comparison with the injured people, who transferred radical sequestrectomy.

The value of the affected by bullet osteomyelitis bone of shin had high value for the recovery of the latter (table 236).

With all methods of treatment the best results were obtained in injured people with bullet osteomyelitis of fibular bone and worst - with osteomyelitis of both bones simultaneously. It is important to note also that the percentage of the recovery, obtained as a result of applying the different methods of treatment, within the limits of the breaks of separate bones had small oscillations. Operation/process on the bone in comparison with other methods of treatment gave most positive results only with osteomyelitis of fibular bone, because with this localization more easily in all it was apply radical operation.

With the course of war was noted an increase in the percentage of recovery after sequestrectomy (table 237).

Table 235. Frequency of the recovery of bullet osteomyelitis of the bones of shin in connection with the method of treatment during the different years of war (in the percentages).

(1) Метод лечения	(2) Годы					(3) В среднем
	1941	1942	1943	1944	1945	
Только консервативный (4)	38,0	45,3	65,7	64,4	62,5	53,8
Операция только на мягких тканях (5)	25,7	42,4	60,0	64,4	63,1	52,1
Операция на костях (6)	48,0	51,3	53,1	51,9	55,0	52,6
В среднем (7)	39,1	43,8	53,3	54,5	56,9	53,2

Key: (1). Method of treatment. (2). Years. (3). On the average. (4). Only conservative. (5). Operation/process only on soft tissues. (6). Operation/process on bones. (7). On the average.

Table 236. Frequency of recovery from bullet osteomyelitis of injured people with the break of the separate bones of shin in connection with the method of treatment (in the percentages).

(1) Локализация остеомиелита	(2) Метод лечения				(5) В среднем
	(3) Только консервативный	(4) Операция только на мягких тканях	(5) Операция на кости	(6) Операция на кости	
Малоберцовая кость (2)	69,3	65,4	77,3	73,2	73,2
Большеберцовая кость (3)	51,0	47,0	53,8	50,9	50,9
Обе кости (4)	43,0	44,4	41,4	43,2	43,2
В среднем (7)	53,8	52,1	52,6	53,2	53,2

Key: (1). Localization of osteomyelitis. (2). Method of treatment. (3). Only conservative. (4). Operation/process only on soft tissues.



(5). Operation/process on bone. (6). On the average. (7). Fibular bone. (8). Tibia. (9). Both bones. (10). On the average.

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The percentage of recovery after sequestrectomy was increased each year of war unevenly, moreover the fluctuation of these indicators with osteomyelitis of different bones was dissimilar; it is possible to establish/install only one general/common/total: a maximum number of recoveries not with one bone it was necessary to 1945. This is explained to a certain degree by the earlier (sometimes premature, at will of injured person) extraction of injured people from the hospital in 1945 in connection with the termination of war.

The dissimilar structure of the bones of shin at different levels conditioned the difference in the percentage of the recovery of osteomyelitis at the different level (Table 238).

Osteomyelitis, which developed in upper third of bones of shin, gave (on the average) a small quantity of recoveries (50.90/o), and developing in lower third - great (55.00/o). With osteomyelitis of the separate bones of shin were obtained the same relationships/ratios, while with osteomyelitis of both bones the

shins (simultaneously) of relationship/ratio proved to be reverse - more frequently was cured osteomyelitis upper third. The more surface arrangement of the bones of shin in lower third provided the best results of the treatment of osteomyelitis at this level.

Table 237. Frequency of the recovery of bullet osteomyelitis of the bones of shin after sequestrectomy during the different years of war (in the percentages) .

(1) / (2) Годы войны							(3)
Локализация остеомиелита		1941	1942	1943	1944	1945	В среднем
Малоберцовая кость (4)	(5)	88,8	72,1	77,6	80,0	73,8	77,4
Большеберцовая кость (5)	(6)	45,0	52,9	53,8	46,5	53,6	51,0
Обе кости (6)	(7)	35,7	35,4	37,5	49,2	41,8	40,6
В среднем (2)		48,0	51,3	53,1	51,9	55,0	52,4

Key: (1) . Localization of osteomyelitis. (3) . On the average. (4) . Fibular bone. (5) . Tibia. (6) . Both bones. (7) . On the average.

Table 238. Frequency of the recovery of bullet osteomyelitis, which complicated the break of the bones of shin at the different level (in the percentages) .

(1) / (2) Уровень перелома		(3) Верхняя треть	(4) Средняя треть	(5) Нижняя треть
Название кости				
Малоберцовая кость (6)	(7)	70,8	70,9	75,6
Большеберцовая кость (7)	(8)	49,1	50,8	54,5
Обе кости (8)	(9)	43,4	41,0	40,9
В среднем (2)		50,9	52,5	55,0

Key: (1) . Name of bone. (2) . Level of break. (3) . Upper third. (4) . Middle third. (5) . Lower third. (6) . Fibular bone. (7) . Tibia. (8) . Both bones. (9) . On the average.

Thus, summing up the results according to the results of the treatment of bullet osteomyelitis of the bones of shin, it is necessary to recognize that the applied methods of treatment were very effective and gave from year to year an increase in the percentage recoveries (from 39.1 to 56.9), in spite of an increase during the war of a number of injured people, who had the complication of osteomyelitis.

The recovery of osteomyelitis only partially solved the problem about the reduction of the ability to work of injured person; therefore it is necessary to be introduced to the clinical issues of the breaks of the bones of shin in injured people, who had the complication of osteomyelitis and not had it (Table 239).

The represented in Table 239 materials make it possible to refine the issue of osteomyelitis itself. In 30.00/o of injured people by basic issue was osteomyelitis - this means that they with the extraction had osteomyelitis in the active form, with the fistulas. It is known that it cured itself from osteomyelitis up to the moment/torque of extraction 53.20/o of injured people, and it was discharged with osteomyelitis 46.80/o. Consequently, 16.80/o of injured people left hospital, having osteomyelitis in the stage of

liquidation, without the fistulas; they have osteomyelitis it was not basic issue and therefore in Table 239 it was not shown. Only 7.00/o of the injured people, discharged from hospital with osteomyelitis, did not have other complications; in the remaining were diverse complications, among which it is possible to note contracture - 48.80/o, strain - 29.00/o, consequences of the damage of nerves - 6.80/o, ankylosis - 2.10/o, etc.

Thus, the best issues were observed in the group of the injured people, who did not have osteomyelitis. This can be judged from many signs: greater it was good issues, less than contractures, ankylosis, false joints and combinations of poor issues; but in this group there were many stumps (3.10/o). The latter fact appears as the equivalent of a large number of uncured osteomyelitis (30.00/o) in the group of the injured people, who had osteomyelitis.

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Table 239. Distribution of injured people with bullet break of the bones of shin, complicated and not complicated osteomyelitis, according to the clinical issues (in the percentages).

(1) Клинический исход	(2) Группа раненых		(3) С остео- миелитом	(4) Без остео- миелита
Хороший . . . . . (5) . . . . .			16,4	32,5
Контрактура . . . . . (6) . . . . .			24,2	19,7
Анкилоз сустава . . . . . (7) . . . . .			4,0	1,4
Ложный сустав . . . . . (8) . . . . .			3,3	0,8
Культи . . . . . (9) . . . . .			1,5	21,0
Остеомиелизит . . . . . (10) . . . . .			30,0	—
Комбинация . . . . . (11) . . . . .			8,7	1,1
Прочие . . . . . (12) . . . . .			11,9	13,5
Итого . . . . . (13) . . . . .			100,0	100,0
Умерло . . . . . (14) . . . . .			1,8	6,4

Key: (1). Clinical issue. (2). Group of injured people. (3). With osteomyelitis. (4). Without osteomyelitis. (5). Good. (6). Contracture. (7). Ankylosis of joint. (8). False joint. (9). Stump. (10). Osteomyelitis. (11). Combination <sup>1</sup>.

FOOTNOTE <sup>1</sup>. Actually combinations were encountered considerably more frequently than it is shown. the majority of the given in Table 239 issues is only the principal part of the "concealed/latent" combinations. In this row are shown the combinations of such complications among which it was difficult to secrete principal.

ENDFOOTNOTE.

(12). Other. (13). Altogether. (14). It died.

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Taking into account a quantity of breaks of different type in the groups of the injured people, which suffered osteomyelitis, and in the group those not had this complication (table 211), the given issues must be explained as follows:

a) a larger number of good issues in the group of the injured people, who did not have osteomyelitis, is caused not only by the absence of the complication of osteomyelitis, but also of presence of a larger quantity of perforated and edge/boundary breaks in this group;

b) a larger number of contractures in the group of the injured people, who had osteomyelitis, is explained by the presence of the complication of osteomyelitis, or of the larger quantity of fragmented breaks in this group;

c) a larger number of ankylosis in the group of injured people with osteomyelitis is explained mainly by this complication, since in this group there was more than the breaks on the average those third (41.50/o), than in the group not had osteomyelitis (37.60/o):

d) the excess of a number of false joints in the group with osteomyelitis is explained only by the presence of this complication;

e) large number of those amputated and dead persons in the group of the injured people, who did not have osteomyelitis, it is caused by the fact that in this group was almost 3 times more than the crushed breaks (table 211), it is almost 5 times more than the complications of anaerobic infection, into 2 and the more of times - septic complications and more than 4 times - complications of shock.

Lethality in the group of the injured people, who suffered osteomyelitis, was 3 1/2 times less than in the control group.

The duration of the hospital treatment of injured people with bullet osteomyelitis of the bones of shin depended on the series/number of the reasons from which most essential were the severity of injury and infections, late surgical intervention and character/nature of surgical intervention.

The value of these factors was reflected in the literature.

Thus, on S. P. Chodkiewicz's data, by the analysis of the



materials of the deep rear in 1 1/2 years of the Great Patriotic War it is established that with the localization of osteomyelitis in both bones of shin the average/mean stay of injured person in the hospital was equal to 218 days, with the localization in the tibia - 201 to day.

High value has a question about that, how the complication of osteomyelitis lengthened the period of hospital treatment (table 240).

Table 240. Distribution of injured people with bullet break of the bones of shin, complicated and not complicated osteomyelitis, according to the duration of hospital treatment (in the percentages).

(1) Группа раненых	(2) Длительность лече- ния (в меся- цах)					(5) Средняя длительность (в месяцах)
	1-3	4-5	6-8	(3) 9 и более	(4) Всего	
С остеомиелитом (6)	2,5	48,6	36,6	14,3	100,0	6,3
Без остеомиелита (7)	19,5	52,0	20,2	8,3	100,0	5,0

Key: (1). Group of injured people. (2). Duration of treatment (in months). (3). and more. (4). In all. (5). Average duration (in months). (6). With osteomyelitis. (7). Without osteomyelitis.

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A great number of injured people was discharged after treatment in the course of 4-5 months. The duration of treatment on the average was considerably more in the group of the injured people, who suffered osteomyelitis (for 1.3 months).

The difference in 1.3 months is the consequence not only of osteomyelitis, but also many other factors among which most important were the character/nature of the break and the character/nature of other complications in each of these groups - it is sufficient to glance at Tables 211 and 219, so that this would become clear. In the

group of the injured people, who did not have osteomyelitis, was almost 3 times more than the crushed breaks also many times more than complications anaerobic and septic infection, which entailed the frequent use/application of amputations; furthermore, in this group was noted almost 1 1/2 times more than the perforated and edge/boundary breaks which ran course more favorable in the relation to osteomyelitis.

Considerably smaller there was the difference in the duration of treatment with the breaks of different bones of shin. The greatest duration of hospital treatment was observed with osteomyelitis of both bones of shin (6.6 months), smallest - with osteomyelitis of fibular bone (6 months), which, on the basis of entire that presented in this chapter is completely understandable.

the average duration of hospital treatment with each year of war was somewhat decreased: by 1941 and 1942 - 6.6 months, 1943 - 6.4 months, 1944 - 6.1 months, 1945 - 5.7 months.

Since with each year of war a number of recoveries of osteomyelitis was increased, the contraction/abbreviation of the duration of hospital treatment must be related due to an improvement in the quality of the treatment of osteomyelitis, but not due to the earlier extraction of the insufficiently treated injured people.

Earlier than all were discharged injured people, who were putting to use only by conservative treatment, in 5.1 months, longer than all were treated transferred operation/process on the bones (sequestrectomy, resection) - 0.6 months. This is explained by the preponderance of the light breaks in the first group and the heavier the secondly, which is sufficiently reflected in this chapter.

SUBPERIOSTEAL RESECTION OF DIAPHYSIS WITH BULLET OSTEOMYELITIS OF THE BONES OF EXTREMITIES.

Candidate of medical sciences the Lieutenant Colonel of medical service G. A. Rusanov.

During the years of the Great Patriotic War and immediately after it large interest caused the operation/process of subperiosteal resection of diaphysis of the bones of extremities with the bullet breaks.

According to the data of the development of the histories of disease/sickness/illness/malady, this operation/process within entire period of war it was subjected to 1.50/o of injured people with the break of femoral bone, 2.00/o - with the break of shoulder bone

approximately/exemplarily the same number of injured people with the isolated/insulated break of tibial, radial and ulna. With breaks of both bones the shins or both bones of forearm to the resection resorted almost 2 times more frequent. With osteomyelitis of fibular bone the resection of diaphysis was conducted most frequently (5.40/o).

Resections were applied both for warning/preventing the development of bullet osteomyelitis and sepsis (during the primary surgical processing of wounds) and for the treatment of the developing or already developing pycnecrotic focus in the bone.

The subperiosteal resection of the diaphysis of long bones with the bullet breaks was applied for the first time in the wars of the middle of past century. To this impelled immense mortality from the suppurative complications of bullet breaks both during the saving treatment and with active surgical intervention - amputations; basis for this operation/process were the experiments/experiences above animals, the demonstrated the possibility of regeneration bones from the side of periosteum.

Technology operations/processes and readings to it in the practice of peacetime were developed by the professor of a medico-surgical academy I. V. Rklitsky, for the first time

successfully who applied subperiosteal resection of the tibia instead of the amputation into 1837 in patient with heavily flowed/occurred/lasted osteomyelitis on the soil of contusion.

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The results of the resections of the diaphysis of the different bones of extremities were described by the author into 1840 in the military medical journal and into "Gazette medicale de Paris".

Already in 1840-1841, soon after publication by I. V. Rklitsky materials on this question, the resection of bones for the elongation/extent was successfully applied by Russian surgeons in the acting army in Caucasus.

The place for resection in the military field surgery defined N. I. Pirogov, after basing the groundlessness of primary ones and the advisability of secondary subperiosteal resections as the method of saving treatment with the injuries of the extremities: "...in the traumatic cases, and precisely in the early operations/processes, periosteum you will almost always find by that contused, torn, and, the main thing, isolated from the soft parts". "...If will be required late resection, then the denser periosteum and it is not difficult to separate from the bone, it more easily lags, than

greeting. Therefore secondary resection can be made almost always with the retention/preservation/maintaining of periosteum, and, therefore, and with the larger hope for the reduction of bone". "The lot of resections on the lower extremities is not thus far yet solved for the military surgery", said he, keeping in mind a very small quantity of favorable outcome of the resections of tibial and especially femoral bone. "In spite of that, economy to shin already and therefore necessary more frequently to test/experience, that the periosteum here is very productive... and we have in the hands an even later resection, which gives with the retention/preservation/maintaining of periosteum hope for success", "...and excess mortality after the amputation of thigh gives to right military surgeon and to now test/experience in the bullet breaks of thigh and shin ... saving treatment, also, with the resection and without it". However, "the saving of a small tibia, radial and ulnas can be boldly included/connected in a number of military field operations/processes, only not early, but late".

Seeing in the resections the substance of a reduction in mortality and number of amputations, N. I. Pirogov voiced hope, "that also the resections of the bones of lower extremities will engage in the course of time the honorary place in the military surgery".

The successes of anesthetization, the improvement of the

immobilization of extremities, development of surgical technology allowed in the first world war some surgeons to be achieved satisfactory results, also, during subperiosteal resections of the diaphysis of femoral bone.

On two successful operations/processes of the resection of femoral bone into 1916 communicated A. Khornborg. He arrived at the conclusion that the amputations can be shown only for the injured people with the damage of vessels and with the especially sharply elapsing and rapidly progressive infection. N. M. Kron in the same year it indicated the successful use/application of subperiosteal resections with the bullet breaks, complicated by sepsis, illustrating by X-ray photographs the regeneration of femoral bone for the elongation/extent to 8 cm. A. L. Lepekhin applied resection with the subsequent stretching of extremity in 209 injured people with the bullet break of tubular bones, including in 22 with the break of thigh. The post-operation defect of femoral bone was equal to 6-14 cm. In all 22 injured bone it regenerated, of them in 20 - the function of extremity was restored/reduced. The shortening of extremity was noted only in 5 injured within the limits 1-3.5 cm.

However, to the Great Patriotic War the subperiosteal resection of the diaphysis of bones did not receive considerable propagation.



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In the Great Patriotic War (especially in the latter/last period) many surgeons for the purpose of warning/prevention or treatment of bullet osteomyelitis and sepsis again began to resort to subperiosteal resection.

The active supporters of the use/application of resections in the different periods after injury they were since 1942 V. S. Levits and Ya. M. Bruskin.

With each year of the war of the resection of bones for the elongation/extant were applied all wider and it is wider (Table 241).

As can be seen from Table 241, the resection of the bones of forearm in 1941 and 1942 was not applied at all. The percentage of the injured people who underwent this operation/process with the injuries of forearm, from 1943 each 1945 increased triply. With that wounded the shin into 1941 resections they did not produce; from 1942 on 1945 percent of those wounded the shin, in which it was applied, it increased 5 times. 38 Times during the war increased the percentage of the injured people in whom was applied the resection with the breaks of thigh.

However, subperiosteal resection of the bones of extremities did not always give positive result. Are especially nonhomogeneous were nonhomogeneous the results of applying the resection within the different periods after the bullet break of the diaphysis of femoral bone.

In the specialized literature of the period of the Great Patriotic War and postwar years are encountered the most diverse responses about the resection of diaphysis, from the extremely positive ones (V. S. Levit, Ya. M. Bruskin, S. O. Portugalov) to the extremely negative ones (A. T. Lidskiy, L. S. Khavkin). Some surgeons (Yu. Yu. Dzhanelidze, N. M. Pricrov, G. Ya. Epstein) related to it reservedly and cautioned from the extensive resections. A number of the authors (M. I. Kuslik, I. A. Krivorotov, Ye. I. Cramer) recommended the performing of this operation/process only in injured people with the bullet break, complicated by heavy infection.

The supporters of resection saw in it the substance of warning/prevention of osteomyelitis and sepsis, and during the development of these complications - substance of the retention/preservation/maintaining extremity. Enemies required the prohibition of resection as the operations/processes of exclusively heavy, that mutilates, that gives an immense quantity of false joints.

However the opinions of authors' majority were based on the brief observations, produced in the different stages of evacuation, within the dissimilar periods after injury and resection and with different technique of operation/process. As a rule, and the number of observations on which the authors based their estimation of this operation/process, was small. The almost full/total/complete absence in the literature of the data about the distant results did not give the possibility to objectively evaluate the results of the subperiosteal resection of the diaphysis of the long bones of extremities.

Table 241. Frequency the subperiosteal resections with the bullet breaks of the bones of extremities during the different years of war (in the percentages).

(1) Локализация перелома	(2) Год	1941	1942	1943	1944	1945	(3) В среднем
Плечо . . . . . (4) . . .	—	—	0,4	1,1	3,0	6,8	2,0
Предплечье . . . . . (5) . . .	—	—	—	1,8	2,3	6,0	1,9
Бедро . . . . . (6) . . .	0,1	0,3	0,9	2,0	3,8	1,5	1,5
Голень . . . . . (7) . . .	—	1,0	2,3	3,8	5,1	3,3	3,3

Key: (1). Localization of break. (2). Year. (3). On the average. (4). Shoulder. (5). Forearm. (6). Thigh. (7). Shin.

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Subperiosteal resection.

From a practical point of view it is especially important it was important to explain the results of applying subperiosteal resection with the bullet breaks of the diaphysis of the femoral bone which in always of war gave the greatest lethality from the sepsis.

For the purpose of obtaining the full/total/complete picture of course and issues of the bullet breaks of thigh, treated with the use/application of resection of diaphysis on different stages of evacuation from the different readings, the author, besides the development of the histories of the disease/sickness/illness/malady of the military medical museum of the military Ministry of the USSR, are studied the distant results of the resections of thigh in 183 injured people.

The resections, which were being applied for the purpose of warning/prevention of osteomyelitis and sepsis, were from 14.0

(thigh) to 20.00/o (shouluer) of all resections, produced for each of these segments.

Readings to the preventive resection were placed, as a rule, during the primary surgical processing. Besides the carving of nonvital soft tissues, during the preventive resection drove out not only free bone fragments and foreign bodies, but also fragments, which remained in connection with the periosteum, the scraps of tendons, fascias and muscles. Comparatively large fragments of bone and sharp ends of the basic scrap, which projected from the wound and contaminated, disengaged periosteum with raspatory and also they drove out.

One should say that during the extraction of fragments and processing of the ends of the basic scrap frequently erroneously together with the bone were driven out the cambium layer of periosteum or the periosteum into entire its thickness. With the cut-off by shears or scalpel of fragments from the fastened to them tendons the periosteum, tightly connected in these places with the bone by all its layers, was driven out completely (it is also erroneous).

To preserve cambium layer, its nourishment and, therefore, the regenerative properties of periosteum managed best anything,

separating/liberating periosteum from the bone together with the surrounding soft tissues and with the surface of the cortical layer of bone.

The damage of periosteum and the disturbance/breakdown of its connection/communication with the muscles with the injury and as a result of the defects surgical of intervention technique were one of the reasons for the delayed consolidation of bone and formation of false joint after early resections.

During the resections of the diaphysis of thigh, which were being conducted during the primary processing of wounds, cutting was applied more frequently (46.7o/o) than sawing (26.7o/o) of the ends of the basic scrap, and both methods were applied into 26.6o/o. During the resections of shoulder bone cutting of the ends of the scrap was conducted 1 1/2 times more frequently than sawing.

The sizes/dimensions of the primary removed sections of bone (switching on fragments and ends of the basic scrap of bone) in separate injured people during the resections of femoral bone reached 20 cm in the length; usually they were 5-8 cm.

In some injured people after resection the wound was washed in hot physiological or soap solution, solution/opening of Rivanol

1:1000; in 2/3 injured people it they powdered by streptocide. Neither completely nor partially wounds after the resections, made during the primary processing, were taken in. In 8.70/o of injured people were plotted/applied the contra-apertures and in 4.30/o was applied loose tamponade of wounds with the ointment of Vishnyovskiy, either with the hypertonic solution of common salt or with the solution of Rivanol.

The approach of basic scrap after preventive resection was not conducted. In all injured people between the scrap was preserved diastasis on the average by size/dimension about 5-6 cm.

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The immobilization of extremity after preventive resections was realized in all injured people by gypsum bandage. In 60.90/o those wounded the thigh gypsum bandage was superimposed immediately after operation/process and installation of scrap under the control of eye. By remaining after operation/process laid splint of Diedrich and only next day or after 2-3 days - gypsum bandage.

The subperiosteal resection of break during the primary processing of wounds caused especially large disagreements among the surgeons both in the period of war and after it. V. S. Levit, A. I.



Savitskiy, seeing in the early radical surgical processing of the wound of bone the most reliable substance of warning/prevention of bullet osteomyelitis and sepsis, they were voiced for the preventive resection. According to their data, after subperiosteal removal/distance of fragments and sawing of the exposed ends of the basic scrap during the primary processing of wound, the bone, almost as a rule, regenerated. The absence of the intergrowth of scrap after resection V. S. Levit it observed in 8.0-10.0o/o of those wounded the thigh. A quantity of the complications of osteomyelitis descended.

Against the primary processing of wounds with the resection of the ends of the basic scrap of bone were voiced I. A. Krivorotov, Ye. I. Cramer, M. I. Kuslik, V. I. Popov, A. T. Lidskiy et al., indicating that by resection does not usually succeed in preventing the development of osteomyelitis and sepsis.

Taking into account that the heavy infection with the bullet breaks is developed not always, but extensive resections, without guaranteeing from the infectious complications, can serve as a reason for false joints, surgeons' majority did not adhere to extremely radical tactics during perfecting of the damages to bone for the preventive targets.

According to the data of author's development, the subperiosteal

resection of the diaphysis of bones, applied for warning/preventing the development of osteomyelitis and sepsis, did not solve the basic task, which was being placed before it.

Thus, in 41.30/o of injured people after the resection of thigh, made during the primary processing, was observed osteomyelitis, also, in 15.20/o - sepsis. This differed little from the percentage of the same complications, obtained in injured people, treated without the use/application of resections (from 27.4 to 47.00/o of complications of osteomyelitis and from 2.4 to 18.30/o - by sepsis) in the various forms of break.

Table 242. Issues in injured people with the bullet fragmented break of the diaphysis of femoral bone in connection with the use/application of subperiosteal resection during the primary processing (in the percentages).

(1) Первичная обработка	(2) Исход	(3) Умерло	(4) Выздоровело				(10) Всего
			(5) после ампутации	(6) с ложным суставом	(7) без ложного сустава		
					(8) с остео- миелитом	(9) без остео- миелита	
(11) с применением поднад- костичной резекции							
(12) (авторская разработка)		11,6	16,3	4,7	19,3	48,1	100,0
Без применения резек- ции (данные разработ- ки истории болезни)		13,0	10,1	0,9	11,0	65,0	100,0

Key: (1). Primary processing. (2). Issue. (3). It died. (4). It recovered. (5). after amputation. (6). with false joint. (7). without false joint. (8). with osteomyelitis. (9). without osteomyelitis. (10). In all. (11). With use/application of subperiosteal resection (author's development). (12). Without use/application of resection data of development of histories of disease/sickness/illness/malady).

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Even the afterward earliest preventive resections, produced into the first day after injury, the percentage of the complications of osteomyelitis it proved to be equal to 45.50/o, into number of which entered 10.00/o of complications of sepsis. In accordance with these

complications the issues of the fragmented breaks of femoral bone in injured people, who were undergoing primary processing with the use/application of "preventive" resection, proved to be even worse, than in injured people, whose resection was not applied (Table 242).

As can be seen from Table 242, in injured people with the bullet break of thigh, that were subjected to resection during the primary processing, in comparison with the injured people, in who "preventive" resection it was not conducted, lethality proved to be smaller (to 1.40/o) and greater there was a number of injured people, discharged with the stump, false joint and osteomyelitis. Furthermore, the duration of treatment in the injured, subjected to resection during the primary processing wounds, to 3 weeks was more: than in those not subjected to this operation/process. All this speaks against the resection during the primary processing, especially if one considers that in the part of the injured people would not be the complications osteomyelitis, also, without the use/application of resection.

Not in favor of preventive resection testify also the given developments of the histories of diseases/sicknesses/illnesses/maladies, given in the VII chapter (pg. 371), on which the percentage of the complications of false joint with the bullet breaks of bones proved to be the higher, the greater

there was the volume of interventions on the bone during the primary surgical processing of wound.

From a number of those wounded the thigh which during the primary processing produced only intervention on the soft tissues, false joints arose in all in 0.7-0.80/o, after the removal/distance of bone fragments - in 1.00/o, and after processing of the ends of the basic scrap - in 5.00/o. Analogous results are obtained, according to the data of the development of the histories of disease/sickness/illness/malady, during the treatment of the bullet breaks and other long bones of extremities. According to the data of the central institute of traumatology and orthopedics, given R. L. Ginsburg, in 8.00/o of observed in the institute injured people with the false joint of shoulder the defects of bone the size/dimension of 12-16 cm were formed after resection.

At the same time early resections confirmed the possibility of obtaining the completely satisfactory results in the relation to the regeneration of bone and retention/preservation/maintaining of the axis of extremity even with the large defect of bone.

Therefore in those a few injured people whose sharp/acute fragments either threatened with the secondary damage of vessels or they projected from the wound exposed and contaminated, and numbness

of which was unavoidable, the use/application of preventive resection it was justified.

Readings to the therapeutic resection were placed, as a rule, prior to the beginning of operation/process on the basis of the estimation of the general state of the injured and detailed study of the place of break. Accesses to the affected sections of bone were the same as with sequestrectomy.

That thickened, sometimes cartilaginous density, periosteum was cut and was stratified by raspatory to the boundaries of macroscopically invariable/unchanged bone. Were revealed all suppurative cavities, flows, were driven out all fragments of bone both sequestered, and viable, and also affected by osteomyelitis or become numb ends of the basic scrap. In 35.50/o those wounded the thigh the ends of the basic scrap were saved, in 27.90/o - were removed by cutting pliers and in 36.60/o were applied both methods or was conducted cut-off by chisel.

Were sawed down scrap more frequent in the zones of diaphysis with the preponderance of compact, and they bit - with the preponderance of porous substance. But during the removal/distance of small sections the bones, for example, only of the sharp ends of the scrap, as a rule, were applied cutting pliers.

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With the operations/processes on the shoulder bone whose resections for the considerable elongation/extent were conducted comparatively rarely, cutting of scrap was applied 1 1/2 times more frequently than saving.

Were introduced into the wound sulfanilamide preparations to the half injured people. The ends of the scrap in 37.10/o of those wounded the thigh were connected, and in 62.90/o of injured people between the scrap was left diastasis by size/dimension from 2 to 8 cm (in average/mean 5.2 cm). The sewing up of wounds is tightly carried out in 11.80/o of injured people (only within the late periods after injury). More frequently was applied the full/total/complete or partial sewing up of post-operation wound with the abandonment of contra-aperture on the posterior surface of thigh. Contra-apertures took the place in 1/3 of all injured people, who were subjected to secondary resection.

The immobilization after secondary resections was realized predominantly in the form of anechoic unlined gypsum bandage whereas which after the resections, which were being finished with the

connection of basic scrap, was superimposed by all injured person, after resections with the retention/preservation/maintaining of diastasis - in 65.50/o.

In 14.30/o those wounded the thigh gypsum bandage was superimposed not right after operation/process, but only on the 2-3rd day, while in separate injured people - on the 2nd week. To this period the extremity was fixed/recorded with the splint of Diedrich or with wire splints. Thinner/less frequent (34.50/o of resections with the retention/preservation/maintaining of diastasis) after secondary resection they resorted to the skeletal/skeleton stretching for the period from 1 week to 5 months with the subsequent replacement by gypsum bandage.

Regarding the use/application of secondary resections among the surgeons in the Great Patriotic War also arose numerous serious disagreements, moreover in essence in the relation to resections with the breaks of thigh.

From proposition to obtain satisfaction subperiosteal resections with terminal osteomyelitis of the diaphysis of long tubular bones in 1942 came forward Ya. M. Bruskin. His proposition underwent the lively discussion and was not obtained general/common/total acknowledgement despite the fact that the official indications called



to the larger surgical activity for warning/preventing the development of osteomyelitis and its treatment.

To the active supporters of secondary resections, besides Ya. M. Bruskina, related V. S. Levit, M. I. Kuslik, Ye. I. Cramer, I. A. Krivorotov, I. M. Levintov, M. M. Langer and many others. Almost all supporters of resections proceeded of the personal experiment/experience of their use/application in the army and front region within the more or less early periods after injury. The operation/process of subperiosteal resection of the diaphysis of bones from a pathoanatomical point of view to a considerable extent was based on the assertion of I. V. Davydovskiy about the fact that basic and leading in bullet osteomyelitis is osteonecrosis in connection with presence of which he recommended earlier and radical removal/distance of the dead or dying/becoming numb bone. "Discussion does not deal not with fighting with the microbes in the wound, but about removing of corpse and then it will not be microbes" (I. V. Davydovskiy).

Objections against the resection advanced V. G. Weinstein, N. S. Znamenskiy, I. L. Krupko, A. T. Lidskiy, Yu. A. Ratner, L. S. Khavkin and some other surgeons, who based their reasons on the work experience mainly in the deep rear.

Speaking about the treatment of osteomyelitis in the sharp/acute phase, A. T. Lidskiy asserted that the resection of the damaged sections of bone not only was not necessary, but on the severity of intervention itself presents a threat of life of injured person.

Published data of the surgeons, who applied resection at the erosion/climax suppuration, are not uniform, but majority of them does not confirm the point of view of A. T. Lidskiy.

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Ye. I. Cramer at the end of 1942 for the purpose of the contraction/abbreviation of a number of amputations in injured people with osteomyelitis of thigh began to apply the subperiosteal resection of bone for the elongation/extent. Already in the beginning of 1943, according to him, by resection it was possible to take injured people away from the state of sepsis. The same noted A. I. Savitskiy and I. A. Krivcrotov.

In 1944, lighting the personal experiment/experience of the use/application of subperiosteal resections of the diaphysis of femoral and other bones of extremities with bullet osteomyelitis, mainly in its sharp/acute stage, came forward D. M. Baranovskiy, I. M. Levintov, L. A. Rabinovich, N. Ye. Slupskiy (pg. 354, Table 247)

and some other surgeons, who worked under M. I. Kuslik's management/manual.

In contrast to the procedure of resections, which was being applied by Ya. M. Bruskin, they all resorted to the connection of scrap after the resection of femoral bone by catgut sutures or by spokes of Kirchner (N. Ye. Slupskiy).

These authors' part confirmed the advisability of resection with the severe suppurative complications of bullet breaks as the method of treatment, which gives the possibility to preserve life and extremity of injured person.

Some surgeons reported that, producing resections with injured person, who are found in the state of sepsis, they derived/concluded them from the heavy state, moreover in the overwhelming majority with the retention/preservation/maintaining of extremity; lethal outcomes it was not. Thus, Ye. I. Cramer for 47 resections of femoral bone with the complication of injuries of sepsis was forced then to amputate extremity in 5 injured people; not one lethal outcome he observed.

S. O. Portugalov for 50 resections of different bones and joints at the erosion/climax of festering in the wound with the marked

septic course in injured people, gloomy to the amputation, resorted to the latter only in one injured person; lethal outcomes it was not also.

With each year of war ever more radical became the treatment of osteomyelitis, also, in its chronic stage. This unavoidably led to the expansion of the use/application of resections. At the conference of the surgeons of the Leningrad Front during January 1944. P. G. Kornev noted that "the radical surgery with the partial or full/total/complete resection of the changed sections of bone ... is normal intervention during the treatment of the old and, in particular, inveterate forms of wound osteomyelitis".

Estimating on the basis of author's materials and data of the development of the histories of disease/sickness/illness/malady clinical issues and distant results of the subperiosteal resection of the diaphysis of the long bones of extremities, used as the method of the treatment of the pycnecrotic damages/defects of bone, one should recognize that in the relation to the recovery of bullet osteomyelitis it gave the best results how this was observed during the use/application of other operations/processes; this concerned mainly injured with the heavily flowed/occurred/lasted process.

In the relation to resections with bullet osteomyelitis (without

the sepsis) of the diaphysis of femoral bone (79.50/o of all resections of thigh from the secondary readings) the aforesaid is confirmed by data of author's development (Table 243).

From Table 243 it is evident that with the aid of of subperiosteal resection with bullet osteomyelitis of thigh it was possible to lower lethality and number of amputations due to an increase in the quantity of false joints and small increase in the number of injured people, discharged with the presence of osteomyelitis.

According to the data of the development of the histories of disease/sickness/illness/malady, in injured people with bullet osteomyelitis of the bones of the shin of resection gave the best results, than sequestrectomy (Table 244).

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As can be seen from Table 244, the average percentage of the recovery of osteomyelitis during the use/application of resection proved to be above (60.0), than during the utilization only of sequestrectomy (52.4). Is especially noticeable advantage of resection with the heaviest injuries of shin with damage of both bones when the technical execution of radical sequestrectomy is

difficult, and the sawing of the ends of the damaged bones accomplishes more easily than during the damage to one tibia.

Resection, which was being applied with the complicated by osteomyelitis isolated/insulated breaks of the tibia, gave the worse results, than sequestrectomy and considerably worse, than resection of both bones of shin. Lack of success of resection with osteomyelitis of this localization is connected, apparently with the tendency not to create the large defects of the tibia whose scrap cannot be drawn together with the integrity of fibular bone.

When during the resection it was possible to remove all nonvital sections of bone, after preserving connection/communication between the basic scrap at least by the small bridge of the feeding periosteum, resection and tibias led to the recovery of osteomyelitis and the reduction of diaphysis for entire elongation/extent of post-operation defect. As illustration to the aforesaid can serve the following observation.

Table 243. Issues in injured people with bullet fragmented break of the diaphysis of femoral bone, complicated osteomyelitis (without the sepsis) in connection with the use/application of subperiosteal resection (in the percentages).

(1) Группа раненых с оскольчатым переломом ослож- ненным остеомиелитом	(2) Исход	(3) Умерло	(4) Выздоровело				(10) Всего
			(5) после ам- путации	(6) с ложным суставом	(7) без ложного сустава		
					(8) с остео- миелитом	(9) без остео- миелита	
(11) С применением поднадкост- ничной резекции (автор- ская разработка) . . . .		0,5	2,9	3,5	27,3	65,8	100,0
(12) Все раненые (данные раз- работки истории болезни)		3,1	4,7	1,0	25,1	66,1	100,0

Key: (1). Group of injured people with the fragmented break by complicated osteomyelitis. (2). Issue. (3). It died. (4). It recovered. (5). after amputation. (6). with false joint. (7). without false joint. (8). with osteomyelitis. (9). without osteomyelitis. (10). In all. (11). With use/application of subperiosteal resection (author's development). (12). All injured (data of development of histories diseases/sicknesses/illnesses/maladies).

Table 244. Frequency of the recovery of bullet osteomyelitis (without the sepsis) of the bones of sain depending on the character/nature of operation/process on the bone (in the percentages).

(1) Локализация остеомиелита	(3) Малоберцовая кость	(4) Большеберцовая кость	(5) Обе кости голени	(6) В среднем
(2) Характер операции				
(7) Секвестрэктомия . . . . .	77,4	51,0	40,6	52,4
(8) Резекция и обработка концов основных отломков . . . . .	77,0	37,5	62,4	60,0
(9) В среднем . . .	77,3	50,8	41,4	52,6

Key: (1). Localization of osteomyelitis. (2). Character/nature of operation/process. (3). Fibular bone. (4). Tibia. (5). Both bones of shin. (6). On the average. (7). Sequestrectomy. (8). Resection and processing of ends of basic scrap. (9). On the average.

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The III, 31 year, 28/III 1945 obtained multiple fragmentation injuries, including on the boundary of middle and lower third of right shin with the multi-fragmented break of the tibia. During the same day on DMP the wounds are split. Immobilization by wire splints.

After 3 days in MPPG is produced the revision of wounds. Is opened festering hematoma of shoulder. Are additionally split the festering wounds of right shin; from the wound canal sharp/acute spoon removed the fine/small fragments of bone and into the wounds is introduced white streptocide. To the right lower extremity is superimposed anechoic gypsum bandage.



The general state of the injured person of average/mean severity; temperature it oscillated in the limits from 37° to 38.7°. Injured person disturbed the gradually grown on pains in the right shin, absence of appetite, insomnia.

3 weeks after injury is taken/removed the bandage. Are discovered the limply granulating wounds with the inflammatory infiltrate around and with abundant suppurative discharge from the depth. Roentgenologically was determined the large/coarse and small-splintered break of the tibia (Fig. 43).

Injured person is operated. The wound of the front face of shin is cut all over. Subperiosteally are removed all become numb and even more viable fragments of the bones, which were abundantly washing by pus. The sharp ends of the basic scrap are sawed. Wounds are sprinkled with white streptocide. In the control X-ray photograph, made immediately after resection, fragments of bone it was not determined. Diastasis between the sawn down ends of basic scrap reached 5 cm (Fig. 44).

Is superimposed anechoic gypsum bandage. The temperature after operation/process only in the first day rose to 38.5°; then within a

week it was lowered to the subfebrile, and through 2 weeks - to the normal. Was improved sleep and appetite.

Upon the exchange of the gypsum bandage 1 1/2 months after operation/process it is discovered, that the wound is carried out by granulations, there are no fistulas. Is assigned ultraviolet lighting, therapeutic exercise.

2 Months after resection the injured person with the walking with the crutches began to load the operated extremity. 2 1/2 Months after resection in the X-ray photograph (Fig. 45) is discovered the well expressed regeneration of the bone between the ends of basic scrap, predominantly from behind it is medial. Diastasis between the scrap from the operation time did not decrease.

In 2 months of 3 weeks after resection (about 3 1/2 months after injury) the injured person is discharged in the satisfactory state with the closed wounds and the joined break, with the moderate limitation of motions in the talocrural joint and the shortening of extremity, which does not exceed 2 cm.

Resection also of sequestrectomy with osteomyelitis of fibular bone (Table 244) gave equally good results, which is explained by the possibility to produce sequestrectomy radically as a result of the

small sizes/dimensions of this bone.

Good results in the relation to the recovery of osteomyelitis, obtained after resection of both bones of shin, darkened by a large quantity of false joints (37.40/o), into dozens of times exceeding a quantity of false joints after one sequestrectomy. The same results in the relation to false joints are obtained after the resection of fibular and tibia.

The dependence of the recovery of bullet osteomyelitis on the radicality of surgical intervention can be noted, also, on other bones of extremities.

On the forearm, similar to shin, the best results in the relation to the recovery of osteomyelitis of separate bones were observed after sequestrectomy and with osteomyelitis of both bones - after resection (Table 245).

During the resection of the diaphysis of shoulder, according to the data of the development of the histories of disease/sickness/illness/malady, the recovery of osteomyelitis was observed in 71.00/o of those operated, while with sequestrectomy - in 60.00/o.

At the same time, it is necessary to note a large quantity of false joints (48.0o/o) after the resection of shoulder apropos of osteomyelitis. It 8 times almost exceeded the total quantity of false joints in injured people with osteomyelitis of shoulder (6.3o/o).

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The resection of diaphysis apropos of heavily flowed/occurred/lasted bullet osteomyelitis (especially thigh and of tibia) was undertaken most frequently in time, beginning from the 4th week to 2 months after injury.

In the fight with csteomyelitis the best results gave use/application of resection in time, beginning from the 4th week to the end of the 2nd month after the injury: 77.8o/o of those wounded the thigh they were discharged from the hospitals without the fistulas and the false joints, and upon the examination/inspection 5 years after resection fistulas they were absent in 92.3o/o.

Resections, produced in the first three weeks after the injury when are not yet clearly visible the boundaries of the pyonecrotic damage/defeat of bone, gave somewhat worse results. The percentage of those discharged of the hospitals without the fistulas and the false joints comprised in this group of injured people by 74.2o/o, upon the

examination/inspection 5 years after resection it did not have fistulas 78.60/o of injured people.

The use/application of resections is later than 2 months after the injury when periosteum by places perished as a result of prolonged festering, and numerous fine/small sequestrations were already frequently included in the sockets of the newly formed bone, gave a small quantity of satisfactory issues. Without the fistulas and the false joints it is discharged from hospitals 62.20/o of injured people, but after 5 years it did not have fistulas 76.70/o.

Immediately after resection the state of injured person frequently deteriorated: was raised temperature and settling velocity of erythrocytes, grew on leukocytosis, was increased the shift/shear of leukocyte formula to the left, was decreased the percentage of hemoglobin in the blood. An increase in the intoxication after operations/processes is explained mainly by the decomposition of wound barrier with each radical surgical intervention. But after 3-5 days, it is more frequent after 3-4 weeks after resection, temperature descended to the subfebrile, the general state was improved, was improved the picture of the blood. This occurred usually the more rapid, the less passed time since the beginning of the development of sharp/acute wound infection before the resection of bone and the more radical carried out surgical intervention. To

the normal numerals the temperature rarely came prior to the beginning of the cicatrization of extensive wound cavities.

As the illustration is given the following observation.

S., 19 years, 8/IV 1945 obtained the perforating fragmentation injury of middle third of right shoulder with the multi-fragmented break of bone. Through several hours on DMP the wounds were split. Shoulder is fixed/recorded by wire splint.

Wounds festered. The temperature of body oscillated from 37.5° to 39°. With the dressings from the wounds were driven out the torn away necrotized tissues.

Table 245. Frequency of the recovery of bullet osteomyelitis (without the sepsis) of the bones of forearm depending on the character/nature of operation/process on the bone (in the percentages).

(1) Характер операции	(2) Локализация остеомиелита	(3) Лучевая кость	(4) Локтевая кость	(5) Обе кости	(6) В среднем
(7) Секвестрэктомия . . . . .		69,4	78,6	56,8	70,4
(8) Резекция и обработка концов ос- новных отломков . . . . .		62,5	70,0	72,7	69,6
(9) В среднем . . . . .		69,2	78,4	57,5	70,3

Key: (1). Character/nature of operation/process. (2). Localization of osteomyelitis. (3). Radial bone. (4). Ulna. (5). Both bones. (6). On the average. (7). Sequestrectomy. (8). Resection and processing of ends of basic scrap. (9). On the average.

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The week after injury is superimposed thoracobrachial gypsum bandage. The state of injured person somewhat was improved, temperature dropped to 37.3-37.6°, but through several days again rose to 38.6°. Grew on pains in the wound. Injured person complained about insomnia, absence of appetite. Were noted the phenomena of the general/common/total intoxication of the organism: Nb 460/o of eras. 2670000, leukocytosis 11950; the formula of the blood: p. 30/o, S. 600/o, mon. 40/o, e. 10/o, lymphs. 320/o; ROE 60 mm an hour.

On the removal/taking of the gypsum bandage 3 weeks after injury was discovered the strain of scapulae and abundant pus discharge from the depth of the extensive granulating wounds, surrounded by dense inflammatory infiltrate. Between the exposed, deprived of periosteum ends of basic scrap is found a large quantity of washed by pus fine/small free fragments of bone and several large/coarse fragments, partially connected with the soft tissues. All bone fragments are removed, the ends of the basic scrap sawed (Fig. 46). Diastasis between them was 6 cm. Wound was sprinkled with white streptocide. Extremity is fixed/recorded by wire splints, and after 5 days - gypsum bandage. Immediately after resection the general state of injured person deteriorated. Temperature oscillated with the spreads/scopes from 36.6° to 38-39.8°. 5 Days after the operation/process: Hb 400/o, eras. 3250000, l. 9700, the leukocyte formula: p. 20/o, s. 680/o, lymphs. 260/o, mon. 20/o, e. 20/o; ROE 64 mm an hour. After the week - Hb 370/o, eras. 1880000, l. 4800, the leukocyte formula: p. 30/o, s. 630/o, lymphs. 280/o, mon. 50/o, e. 10/o; ROE 66 mm. an hour. 3 Weeks after resection upon the exchange of gypsum bandage was discovered the delay of the outflow of pus from the wound. Into the wound is introduced the drainage. Temperature during 3 days was lowered to the normal and no longer it heaved. 5 Weeks after the resection: Hb 490/o, eras. 3290000, l.



8300, the leukocyte formula: p. 30/o, s. 660/o, lymphs. 240/o, mon. 40/o, a. 30/o; ROE 30 mm an hour. 1 1/2 Months after resection on the removal/taking of gypsum bandage it is established/installed, that scrap of bone are joined. Is roentgenologically discovered the wide bone regenerate, which connects scrap of bone (Fig. 47). On the spot of the removed drainage small fistula with scanty discharge. Without supplementary interventions the fistula through 2 weeks was closed.

2 1/2 Months after resection even 3 1/2 after injury the injured person is discharged from hospital without the fistula in the satisfactory state, with the joined break, the considerable limitation of motions in the shoulder and elbow joint.

Is especially effective the use/application of resections for the purpose of the retention/preservation/maintaining the damaged extremity and life of injured person with the bullet break of femoral bone, complicated by sepsis.

As can be seen from Table 246, with the sepsis the percentage of cured with the preserved extremity in the group injured people, who were subjected to resection, proved to be doubly large in comparison with the group of all injured people with the sepsis, and the percentage of amputations 1 1/2 times less with a reduction in the lethality.

Table 246. Issues in injured people with the bullet break of the diaphysis of femoral bone, the complicated sepsis, in connection with the use/application of subperiosteal resection (in the percentages).

(1) Группа раненых	(2) Умерло	(3) Выздоровело				(7) Всего
		(4) после ампу- тации	(5) с ложным суставом	(6) без лож- ного сустава		
(8) Раненые, у которых применялась поднадкостничная резекция диафи- (9) за (авторская разработка) . . . . .	38,3	22,5	1,2	38,0	100,0	
Все раненые с сепсисом, независимо от вида и уровня перелома (дан- ные разработки историй болезни)	44,8	35,7	0,4	19,1	100,0	

Key: (1). Group of injured people. (2). It died. (3). It recovered.  
(4). after amputation. (5). with false joint. (6). without false  
joint. (7). In all. (8). Injured people, in whom was applied  
subperiosteal resection of diaphysis (author's development). (9). All  
injured people with sepsis, independent of form/species and level of  
break (data of development of histories of  
disease/sickness/illness/malady).

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During the analysis Table 246 one must take into account that  
into the group of "all injured people with the sepsis" entered not  
only such, due to the health status it would have been possible to  
make resection, but also injured people who due to the severity of  
the state either of generally no operation/process underwent or it

was possible to produce only amputation. By this partly it is possible to explain large lethality and larger number of amputations in the group of all injured people with the sepsis. On the whole among the injured people with the break of thigh, complicated by sepsis, as in injured people with the break, complicated by osteomyelitis (Table 243), with the aid of the cross resection it was possible to lower lethality and to decrease a number of amputations due to an increase in the number of false joints.

Resections apropos of the complications of the sepsis of the breaks of femoral bone composed 20.50/o of all resections on this segment from the secondary readings. Were undertaken they more frequent in the first three weeks after injury (9.40/o of resections from the secondary readings), thinner/less frequent - in time, beginning from the 4th week to the end of the 2nd month after injury (8.70/o) and most rarely - are later than 2 months (2.40/o).

The issues of resections with the sepsis were the better, the earlier the resection was applied.

As illustration can serve the following observation.

L., 36 years, 23/VII 1943 it is injured by fragment into middle third of right thigh. Multi-fragmented break of bone. Injury set,

through and blind. During the same day of wound are split, removed the free fragments of bone. Is superimposed the splint of Diedrich.

Wounds festered. From the first days after injury the temperature was held in limits of 38-39° and was not lowered considerably after the application of the gypsum dressing the week after injury.

2 Weeks after injury state heavy, integuments pale with the icteric hue, the tongue of dry. Pulse of 110 shocks per minute. Liquid, quickened chair/stool. State of sepsis. Is diagnosed suppurative flow. Wound on the external surface of thigh is expanded, opened flow and cut away the exposed from the periosteum sharp end of proximal fracture. Is superimposed anechoic gypsum bandage.

The state of injured person was not improved. Grew on depletion. Temperature with the large spreads/scopes oscillated in the limits to 39°. Pus abundantly was secreted through the fistulas in depth of which were probed the exposed scrap. 1 1/2 Months after injury the picture of the blood: Hb 45o/o, eras. 2830000, l. 4930, p. 12o/o, s. 44o/o, lymphs. 30o/o, mon. 12o/o, e. 2o/o; ROE 32 mm an hour. Is roentgenologically diagnosed osteomyelitis of fragments and ends of the basic fragments of bone (Fig. 48). Is undertaken the attempt to preserve extremity by subperiosteal resection of diaphysis. Resection

is made 8/IX 1943. Are removed all fragments of bone and affected by osteomyelitis ends of the proximal and extremital scrap in the limits of healthy/sound bone tissue. In all are removed about 10 cm of bone. Between the scrap is left diastasis 5 cm.

State after resection neavy. In the first day the temperature to 39.6°, from the third day - to 38.3-38.7°.

During the revision of wounds on the 2nd and 3rd week after resection it is discovered, that the ends of the scrap are covered with periosteum and granulations, with exception of the external edge of extremital break for the elongation/extent 1 cm. Latter/last was cut away. The state of injured person gradually was improved. On the 9th day after resection temperature of 37.5-38.7°. Picture of the blood: Hb 43o/o, eras. 2530000, l. 6100, p. 10o/o, s. 64o/o, lymphs. 16o/o, mon. 8o/o, e. 2o/o; ROE 33 mm an hour.

Through 2 weeks (during the day of the revision of wound) temperature of 37.2-39.5°. Picture of the blood: Hb 50o/o, eras. 2760000, l. 6700, p. 7o/o, s. 62o/o, lymphs. 22o/o, mon. 6o/o, e. 3o/o; ROE 50 mm an hour.

From the 5th week after resection the temperature is normal. The blood transfusion was conducted before the resection and in the

course of the month after it.

In 5 months Hb 70g/o, aras. 4610000, the shift/shear of leukocyte formula to the left was absent; ROE 6 mm an hour.

On the 4th month after injury roentgenologically was determined usual intensity the regenerate, more expressed from the medial side of the defect of diaphysis (Fig. 49).

Repeated operations/processes it was not. Injured person is discharged from hospital on the 7th month after resection and on the 9th after injury without the fistulas, with the joined break and the shortening of extremity on 3 cm.

The distant results 5 years after the resection: there are no fistulas and after extraction from the hospital they did not appear. Repeated operations/prcesses it was not. Foot functions without the limitation. It works in the kolkhov.

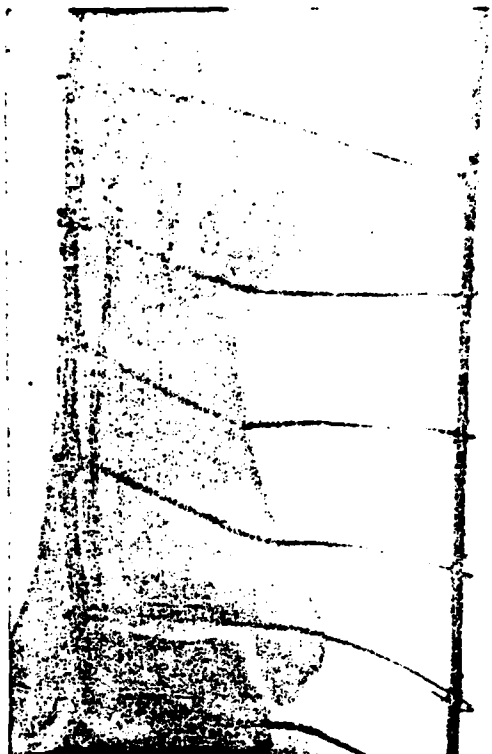


Fig. 43. Sh., 31 year. Photograph of the right shin 3 weeks after injury. Large/coarse and small-splintered break of the tibia.



Fig. 44. The same injured person. Photograph is made immediately after resection.



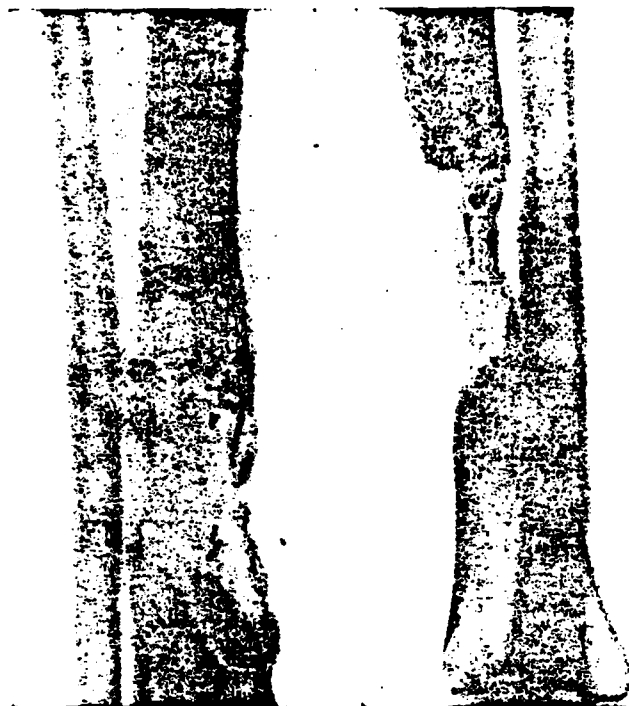


Fig. 45. The same injured person. X-ray photograph 2 1/2 months after resection. There is a well expressed bone regenerate between the ends of basic scrap.

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Fig. 46.



Fig. 47.

Fig. 46. S., 19 years. The resection of right shoulder is made three weeks after injury.

Fig. 47. The same injured person. 1 1/2 Months after resection. There is a wide bone regenerate, which connects scap.

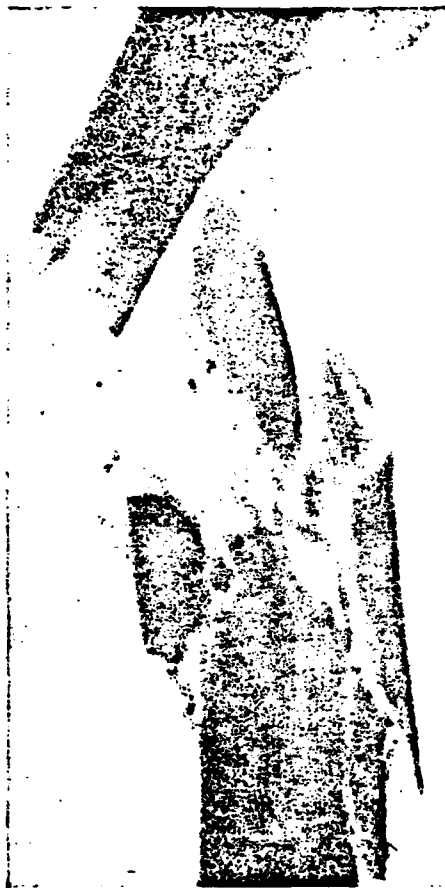


Fig. 48.

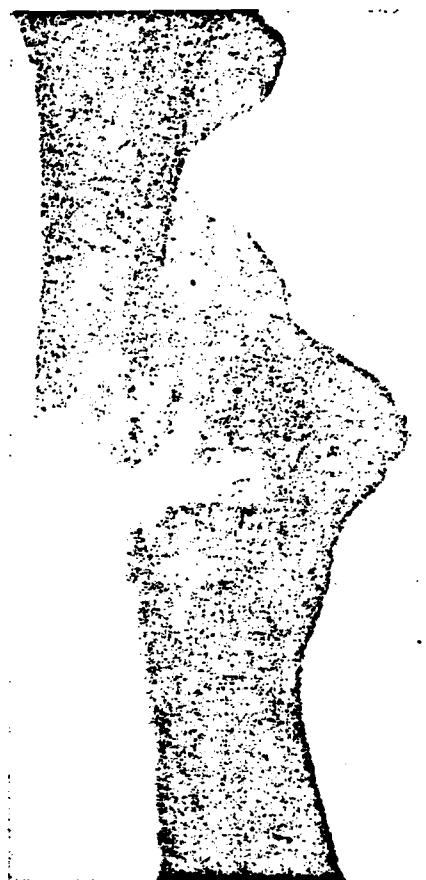


Fig. 49.

Fig. 48. L., 36 years. Photograph 6 weeks after injury. Osteomyelitis of fragments and ends of the basic fragments of right thigh.

Fig. 49. The same injured person. Photograph 2 months after resection.

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M. S. Znamenskiy, I. L. Krupko, A. T. Lidskiy, Yu. A. Ratner, V. D. Chaklin and many other surgeons as the basic argument against the resections advanced the inevitability of obtaining after it a large quantity of false joints.

As basis for such assertions served mainly the personal impressions of the surgeons of the back therapeutic institutions, which observed accumulated in the rear injured people with the delayed consolidation and the false joint (L. I. Shulutko, L. S. Khavkin, Yu. A. Ratner, P. R. Bogdanov).

These considerations, characteristic for the surgeons of the deep rear and which were being based predominantly on the observations of unsuccessful issues in the clinics and the institutes, could not have the preceding value for the surgeons of front region, before whom, besides the risk of obtaining pseudoarthrosis in the future, stood frequently the real danger of the loss of extremity and even life of injured person.

But also a threat of obtaining false joint after the resection

of supporting/reference bones, in particular, femoral, proved to be as not large as it was possible to assume/set based on materials of some mentioned authors (L. I. Shulutko, L. S. Khavkin, F. R. Bogdanov, I. L. Krupko). To hundreds of injured people, by which was conducted the resection of the diaphysis of femoral bone in the period of the Great Patriotic War, the intergrowth of scrap was obtained in the overwhelming majority (Table 247).

If we examine observations with the known issues on all graphs/counts, then it will be obtained that on 370 injured people died 3.20/o, it is produced amputations 7.80/o, it is discharged with false joint 11.90/o and it is discharged without amputations 77.10/o.

A number of the authors, who have available a sufficient number of traced injured people with the resection of the diaphysis of femoral bone, it communicates about the considerably smaller percentage of nonadhesions. Thus, M. M. Langer on 83 injured people, who were being long observed by it in the front region after resections with the abandonment of diastasis, it stated/established nonadhesion of bone in 4 people; Ye. I. Cramer for 47 such resections in the front region of false joints in no way it observed. It did not reveal/detect false joints in the front region also N. Ye. Slupskiy and majorities of surgeons, which applied after resection osteosynthesis. Generally best results were obtained by those authors

who produced resections during the relatively favorable course of bullet osteomyelitis of thigh and did not apply them with the sepsis.

According to the data of author's development, the intergrowth of scrap of the diaphysis of the thigh of bone after subperiosteal resection occurred in 94.10/o of injured people. The percentage of false joints both after the preventive subperiosteal resections of femoral bone and after the resections of this bone from the secondary readings composed 5.9 (to a number of those discharged with the preserved extremity).

False joints appeared after resection with the abandonment of diastasis between the scrap comparatively more frequently than after resection with the connection of basic scrap of bone, moreover this was not found in direct dependence on the presence and the sizes/dimensions of post-operation diastasis between the scrap of bone.

The basic reason for the formation of false joints was the death of periosteum as a result of injury, errors in the technology of surgical intervention or suppuration of wound.

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Table 247. The reference data about subperiosteal resections of the diaphysis of femoral bone, according to different authors' data, which relate to the period of the Great Patriotic War and after it (absolute numbers).

(1) Автор	(2) Год опубликования работы	(3) Этап, на котором про- водилась операция	(4) Число наблюдений	(5) Показания к резекции	(6) Исход				
					(8) умерло	(7) выздоровело			
						(9) после ампута- ции	(10) с сохраненной конечностью	(11) с полным суданом	(12) без лон- гиты су- става
(13) Д. М. Барановский	1945	РЭП	29	(14) Остеомиелит		(15) Сведений нет			
(16) Я. М. Брускин	1945	Глубо- кий тыл	16	(19) "	0	0	4	12	
(18) Н. С. Воронов	1947	ППГ	12	(19) Сепсис	Сведе- ний нет	1	(15) Сведений нет		
(20) Г. И. Гогмберидзе	1946	Тыл	7	(19) Остеомиелит	0	0	0	7	
(21) И. И. Гусаров	1946	ГБФ	3	"		Сведений нет			
(22) И. С. Каган	1946	Тыл (24) фронта	8	"	0	0	(15) Све- дений нет	2	
(23) Н. Б. Колоднер	1945	Тыл (21)	5	"	0	0	0	5	
(24) Д. А. Коган	1945	РЭП	1	"	0	0	0	1	
(25) Е. И. Кремер	1949	Тыл (21)	47	(29) "	0	(15) 5	0	42	
(26) И. А. Криворотов	1945	ГБФ	23	Профилактика остеомиелита	Сведений нет				
(27) С. И. Кузьминский	1947	ГБФ	4	Остеомиелит	0	(15) 0	1	3	
(28) М. М. Лангер	1948	ГБФ	175	Остеомиелит и сепсис	Сведений нет (из 83) (из 83)				
(29) И. М. Левинтов	1945	РЭП	9	Остеомиелит	4	4	(15) Сведений нет		
(30) И. И. Метелца	1947	ППГ	9	Профилактика остеомиелита	6	(15) Сведений нет			
(31) Ю. С. МIRONENKO	1947	ГБФ	28	Остеомиелит	3	5	(15) Сведений нет		
(32) Б. К. Осинов	1944	ГБФ	3	(39) "	Сведений нет				
(33) И. А. Рабинович	1945	РЭП	44	Осложненный перелом без сепсиса	2	0	2	40	
(40) Г. А. Русанов	1945	ГБФ	10	Остеомиелит					
(41) Н. Е. Слущкий	1944	РЭП	54	Остеомиелит и сепсис	0	0	0	10	
(42) Н. В. Слюсарь	1945	ГБФ	2	"	(15) 1	5	0	48	
(43) С. В. Тенлов	1946	Тыл (21)	41	Остеомиелит и сепсис	Сведений нет				
(44) Г. Н. Туманов	1945	РЭП	1	Остеомиелит	0	0	0	1	
(45) И. Ю. Фефер	1945	ГБФ (75)	93	"	4	10	10	69	
(46) Л. С. Хавкин	1947	Сведений нет	18	Сведений нет	0	2	7	9	
(47) Шеналевский	1946	Тыл (21)	17	(29) Сепсис	2	1	3	11	
(48) И. Н. Шулютко	1946	ГБФ	15	Сведений нет	0	0	15	0	
(49) Всего резекций . . .			838						

Key: (1). Author. (2). Year of publication of work. (3). Stage, in which was conducted operation/process. (4). Number of observations. (5). Readings to resection. (6). Issue. (7). it recovered. (8). it died. (9). after amputation. (10). with preserved extremity. (11).



with false joint. (12). without false joint. (13). D. M. Baranovskiy. (14). Osteomyelitis. (15). There is no information. (16). Ya. M. Bruskin. (17). Deep rear. (18). N. S. Voronov. (19). Sepsis. (20). G. I. Gogiberidze. (21). Rear. (22). I. I. Gusarov. (23). Ts. S. Kagan. (24). Rear of front. (25). I. M. Kolodner. (26). D. A. Kogan. (27). Ye. I. Cramer. (28). I. A. Krivorotov. (29). Prophylaxis of osteomyelitis. (30). S. I. Kuz'minskiy. (31). M. M. Langer. (32). Osteomyelitis and sepsis. (33). from. (34). I. M. Levintov. (35). I. I. Matelits. (36). Yu. S. Mironenko. (37). B. K. Osip. (38). L. A. Rabinovich. (39). Complicated break without sepsis. (40). G. A. Rusanov. (41). N. Ye. Slupskiy. (42). N. V. Slyusar'. (43). S. V. Taplov. (44). G. N. Tumanov. (45). I. Yu. Fefer. (46). L. S. Khavkin. (47). Shevalevskiy. (48). L. I. Snulutko. (49). In all resections.

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According to the data of the development of the histories of disease/sickness/illness/malady, with the crushed breaks of diaphysis with the defect of bone and periosteum false joints appeared more frequently than with the breaks, which were being accompanied by the smaller damages of periosteum. Thus, with the crushed breaks of shoulder false joints were formed in 23.50/o of injured people, with the fragmented ones - in 5.0-8.30/o, and with the longitudinal ones - in 1.20/o. The same dependence was noted on other segments. On the

value of osteomyelitis in the onset of false joints it is shown on pg. 370. With the injuries of shoulder, complicated by pseudoarthrosis, osteomyelitis was observed in 64.30/o of injured people, and in all injured people it composed 39.30/o.

Many authors (N. N. Petrov, S. S. Girgolav, M. D. Verevkin, I. L. Krupko et al.) placed the possibility of the regeneration of bone in the dependence on the age of injured person, noting that in adult ones, especially in elderly people, the regeneration after subperiosteal resection of diaphysis begins rarely or in no way it begins. The observations of Ya. M. Bruskin and many other authors do not confirm this point of view.

According to the data of author's development, where with the bullet breaks of thigh it was possible to manage the infection, after preserving periosteum, bone during post-operation diastasis regenerated independent of the age of injured people, and the duration of treatment in the hospitals after resections proved to be even somewhat smaller in those operated older than 40 years. But lethality in this age proved to be triply higher than average/mean lethality after the resection of thigh. More than in the half dead persons lethality is connected with the sepsis.

Table 248 depicts the data of author's development about the

issues after subperiosteal resection of the diaphysis of femoral bone in connection with the age of the injured people (are given only the injured people, in whom was preserved diastasis between the scrap).

As can be seen from Table 248, a great number of those recovered with the preserved extremity and without false joints (81.50/o) proved to be during the resections of thigh, made injured person at the age from 30 to 40 years.

Given data sufficiently convincingly show the possibility of the successful use/application of subperiosteal resections not only at the young age, but also in elderly people.

The series/number of surgeons rejects the resection of diaphysis, considering as the its operation/process, which considerably lengthens the periods of the consolidation of break. Actually/really, even with the connection of scrap the periods of treatment after the resections of femoral bone, according to I. M. Levintov, reached 7 months.

At the same time the series/number of surgeons observed the intergrowth of the bone 2-3 months after resection both with the use/application of a bone suture and with the abandonment of diastasis (I. M. Levintov, L. A. Rabinovich, Ye. I. Cramer et al.).

Table 248. Issues in injured people, who were subjected the subperiosteal resection of the diaphysis of femoral bone, in connection with the age (in the percentages).

(1) Возраст оперированных	(2) Исход	(3) Умерло	(4) Выздоровело			(6) Итого	(7) Длительность лечения после резекции (в днях)
			(5) после ампута- ции	(8) с ложным суставом	(9) без лож- ного сустава		
(10) 19 лет . . . . .		5,3	16,0	5,0	73,7	100,0	247
20—29 лет (11) . . . . .		7,7	10,7	9,3	72,3	100,0	230
30—39 лет . . . . .		5,6	5,6	7,3	81,5	100,0	232
40 лет и старше (12) . . . . .		18,5	3,7	3,7	74,1	100,0	209

Key: (1). Age of those operated. (2). Issue. (3). It died. (4). It recovered. (5). after amputation. (6). with false joint. (7). without false joint. (8). Altogether. (9). Duration of treatment after resection (in days). (10). years. (11). years it is older.

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Ya. M. Bruskin after the resections of femoral bone with the abandonment of diastasis roentgenologically detected the appearance of a bone regenerate 2-4 weeks after resection, his full/total/complete developments - to 4-6 months and the full/total/complete reduction of the function of extremity in time from 6 to 12 months.

After the resection of the tibia, produced apropos of osteomyelitis is later than 1 1/2 months after injury, Ya. M. Bruskin rarely observed full/total/complete regeneration. Better occurred regeneration after early resections. But also in the incomplete regeneration of bone the function of extremity, according to his data was restored, and injured people when pseudoarthrosis of the tibia is present, freely walked without the crutches and the bacillus/rod. After the resection of fibular bone the wound was occluded in 1-1 1/2 months, and in the course of 2-2 1/2 months bone regenerated.

The healing of wound after the resection of shoulder bone according to the observations of Ya. M. Bruskin occurred in the

course of 1 1/2-2 months. teniform growths of periosteum were revealed/detected roentgenologically already on the 3rd week and 2 1/2-3 months after early resections the bone regenerated completely. After late resection apropos of bullet osteomyelitis (3-6 months after injury) the regeneration of bone occurred slowly, not for entire elongation/extent of defect, and frequently appeared pseudoarthroses.

After the early of the resections of the bones of forearm the beginning of regeneration roentgenologically was determined 2-3 weeks after operation/process, wound was occluded in 1 1/2 months; the full/total/complete reduction of bone, according to Ya. M. Bruskin's data, occurred 2-2 1/2 months after resection.

Based on materials of author's development, the first signs of the regeneration of femoral bone after early resection were revealed/detected roentgenologically usually after 3-5 weeks after operation/process. In time from 5 to 8 weeks the regenerate was determined in the X-ray photographs already is completely distinctly by the shadow of greater or smaller width, nonuniform intensity and diverse form. In the course of the 3rd month after resection the shadow of bone regenerate reached by places or for entire elongation/extent of the intensity of the shadow of marrow space. In time from 3 to 4 months the regenerating section of bone gave usually

the shadow, which corresponds in the intensity of the shadow of cortical layer, and after 4-5 months - even more intense.

The first recordings in the histories of disease/sickness/illness/malady about the palpatory determination of the sometimes sufficiently dense, but easily bending callus relate to the 5th and 6th week after resection. Recordings about the fact that the injured person can raise the independently elongated foot, were encountered for the first time 11 weeks after operation/process with the abandonment of diastasis between the scrap and through 9 weeks when the ends of the scrap were approached to the contact. The earliest period when injured people began to walk without the gypsum bandage after the early produced resection of thigh with the abandonment of diastasis between the basic scrap of diaphysis, was 14 weeks, and without the abandonment of diastasis - 10 weeks.

Of the observations of the author the course of the regeneration of bone and the periods of the reduction of the function of extremity after resection depended, first of all, on the degree of the damage to bone, the periosteum and surrounding tissues with the injury, the subsequent complications and the operations/processes, from the periods of operations/processes after injury, from the general state of injured person. But also the course of regeneration, and functional results of operation had special features/peculiarities,

characteristic for each of the bones of extremities.

Other conditions being equal, it is best anything and most rapidly regenerated usually fibular bone, worst of all - tibial and especially shoulder.

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The function of extremity after the resection of fibular bone was reduced, as a rule, most complete within the most shortest periods. Even considerable sizes/dimensions the defects of this bone gave the possibility 2-3 weeks after operation/process to without difficulty load extremity, through 3-4 weeks to remove/take gypsus bandage, and it was not need in the special concerns about the reduction of function. The post-operation defects of the bones of forearm required the greatest attention in the relation to the function of extremity. But early (not later the 10th day after operation/process) the use of therapeutic gymnastics during a strict individualization of its forms/species and dosages made it possible to be achieved fair both anatomical and functional results during the periods up to 2-2 1/2 months after resection.

Roentgenologically the beginning of the regeneration of bone was detected approximately within the same periods after the



subperiosteal resection of the diaphysis of all long bones of extremities. The shadow of the regenerating bone tissue appeared usually immediately all over length of the post-operation defect of bone. With the smaller thickness of bone the full/total/complete reduction of the defect of its diaphysis occurred usually more rapidly. Scar tissue on the course of bone defects (with the equal approximately/exemplarily degree of damages and suppurative complications) was developed after the resection of fibular bone and bones of forearm in a smaller quantity than after the resection of tibial, femoral and shoulder bone, which was possible to see with the repeated operations/processes.

On the reduction of the function of extremity after the resection of the diaphysis of long bones positively was manifested the presence of secondary undamaged/uninjured bone in the segment. Especially noticeably this was during the resection of fibular bone, less - during resection of one of the bones of forearm, it is still less - during the resection of one tibia.

The strength, which made it possible to load extremity, regenerate acquired, as a rule, the more rapid, the shorter there was the defect of bone. With the equal sizes/dimensions of defects most slowly occurred usually the reduction of the function of extremity after the resection of tibial and femoral bone.

The periods of the regeneration of bone noticeably affected the general state of injured people. Attention is drawn to the delay/retarding/deceleration of the regeneration of bone and the elongation of the periods of treatment in the separate injured people who, besides the unfavorable conditions in the wound, were weakened by the prolonged festering of the associated, sometimes multiple wounds. The more prolonged periods of the regeneration of bone were noted also in those, who obtained injury in the autumnal months when the reduction of bone flowed/occurred/lasted in essence in winter, under the relatively worse hygienic conditions of the closed rooms, with the smaller possibility to utilize the Sun, air, vitamins. Thus, the obtained bullet break thighs from March to May were treated on the average of 236 days, and injured people in the period September - November - 314.

The large post-operation shortenings of extremities which indicate the enemies of resection, they actually/really occurred after extensive resections. But, in the first place, they hardly can serve as basis for the non-application of this operation/process of instead of amputation for the purpose of the rescuing of the life of injured person, and in the second place, they are not unavoidable. Even in the presence of the cross defect of femoral bone together

with the periosteum when in the opinion of surgeons' majority, it is completely necessary to draw together the ends of the bones to the full/total/complete contact, it is possible to avoid shortening, without welding of the scrap, but producing the primary or secondary substitution of defect by bone transplant.

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Primary plastic surgery by "pure/clean bone" in some injured people successfully applied after extensive resections M. I. Kagan. The bright operations/processes of the secondary substitution of the large defects of femoral bone are published by N. A. Bogoraz.

In those injured people, by which succeeds in preserving periosteum and managing the heavy infection, it is completely possible, applying skeletal/skeleton stretching, to avoid the approach of scrap and to obtain the regeneration of bone for entire elongation/extent of post-operation defect (Ye. I. Cramer, M. M. Langer, Ya. M. Bruskin).

According to the data of author's development, the shortening of extremity after the resection of femoral bone oscillated in the limits of 1.5-12 cm. In some injured people after the resections 16-17 cm of diaphysis the shortening of extremity was 3.5-4.5 cm. But

were injured people with shortening of extremity to 12 cm after of the resection of bone for the same elongation/extent.

On the average after the resection of femoral bone with the subsequent junction of the ends of the basic scrap the shortening of extremity proved to be equal to 6.8 cm, also, after resection with the retention/preservation/maintaining of diastasis - 6.4 cm.

After the resection of the diaphysis of femoral bone with the abandonment of diastasis between the scrap the length of extremity, as a rule, was gradually decreased on 2-4 cm, but in separate injured people as a result of prolonged skeletal/skeleton stretching was observed an increase in the length of extremity in comparison with the length, obtained immediately after operation/process.

The shortening of extremity usually occurred due to the larger or smaller approach of the ends of the basic scrap of bone, which was that more expressed after the resection of the diaphysis of thigh, shoulder or both bones of forearm and shin.

After the resection of one fibular bone of noticeably shortened of bone defects it was not observed, just as in some injured people after resection of one of the bones of forearm.

Decrease of the distance between the basic scrap of diaphysis and bending of axis in the place for resection occurred usually already during the first days after operation/process. The reason for this was initially the elastic thrust/rod of muscles, mixing the ends of the scrap, and frequently and displaced to one side or at an angle, and later - cicatrization of the extensive wounds of soft tissues.

The shortening of extremity progressed sufficiently rapidly in the first 2-4 weeks after resection, then in the period to 2-2 1/2 months it is slower. Later than this period the sizes/dimensions of diastasis between the scrap with the applied immobilization by gypsum bandages were virtually unchanged.

During the permanent monitoring of the position of scrap, upon the timely exchange and during the careful modelling of gypsum bandage were obtained the completely satisfactory results: the shortenings of extremity did not exceed 1.5-2 cm. The observed sometimes considerable shortenings and bendings of extremity after resection (in the absence of the large defects of periosteum) it was possible not only to prevent, but also to amend, in proper time applying skeletal/skeleton stretching during 3-8 weeks by the individually metered loads (from 5 to 15 kg.).

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EXPERIENCE OF SOVIET MEDICINE IN A GREAT PATRIOTIC WAR, 1941-19--ETC(U)  
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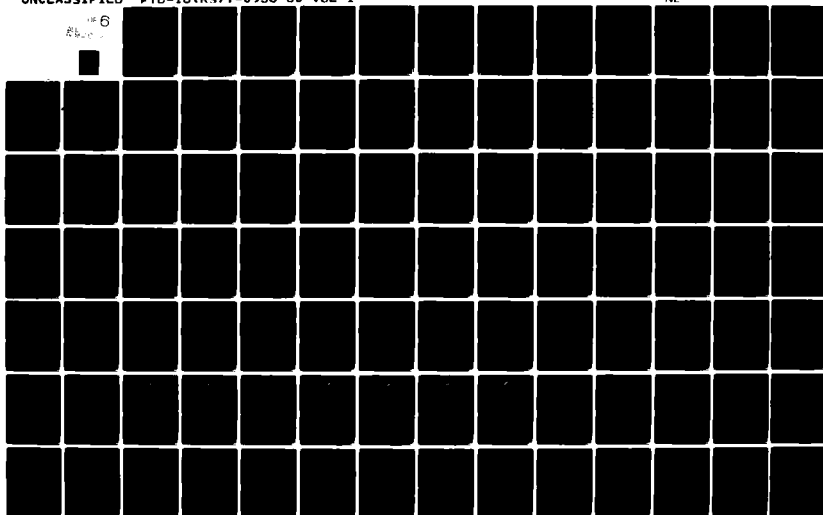
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The junction of the ends of the scrap to the contact impeded outflow from the narrow cavity, which contributed more frequent generalization of infection. Lethality and number of amputations with this method proved to be above than upon the abandonment of diastasis.

In the relation to the course of osteomyelitis special importance had the method of processing the ends of the basic scrap of bone. Thus, after the saving of the ends of the scrap of thigh it was discharged with fistulas 14.10/o of injured people and after 5 years had fistulas 4.20/o of subjects, and after chipping by cutting pliers - with respect 39.3 and 22.00/o.

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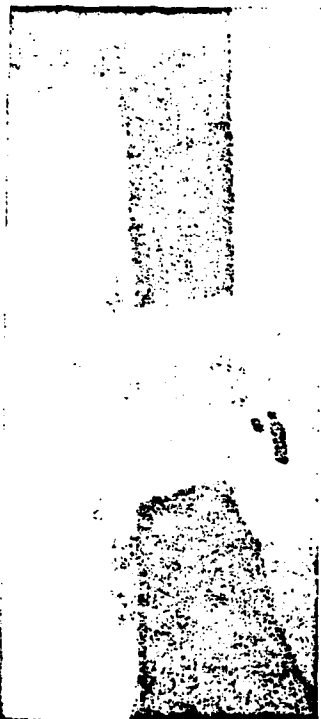


Fig. 50.

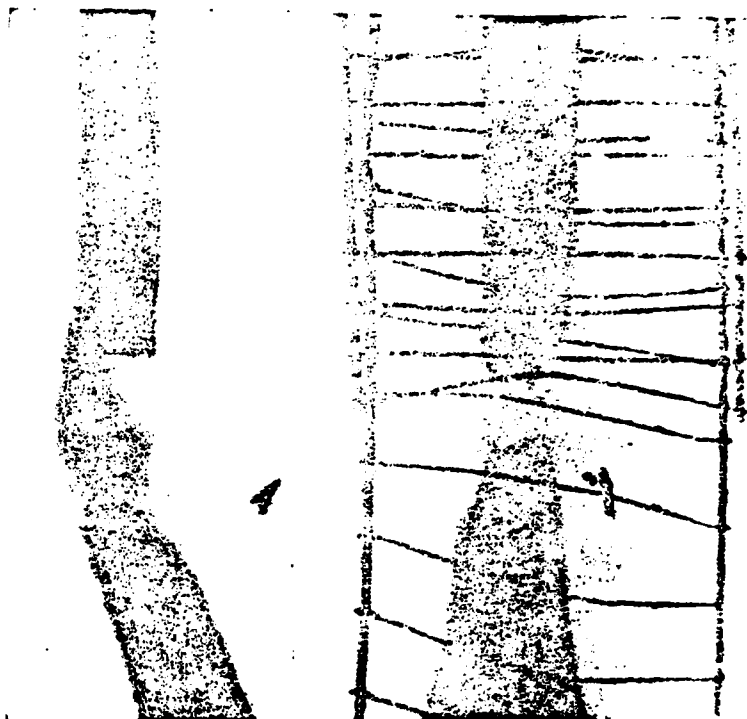


Fig. 51.

Fig. 50. V., 19 years. The resection of left thigh is made during the day of injury. X-ray photograph is made on the 24th day after resection.

Fig. 51. The same injured person. X-ray photograph 75 days after resection. Evidently good reduction of bone.



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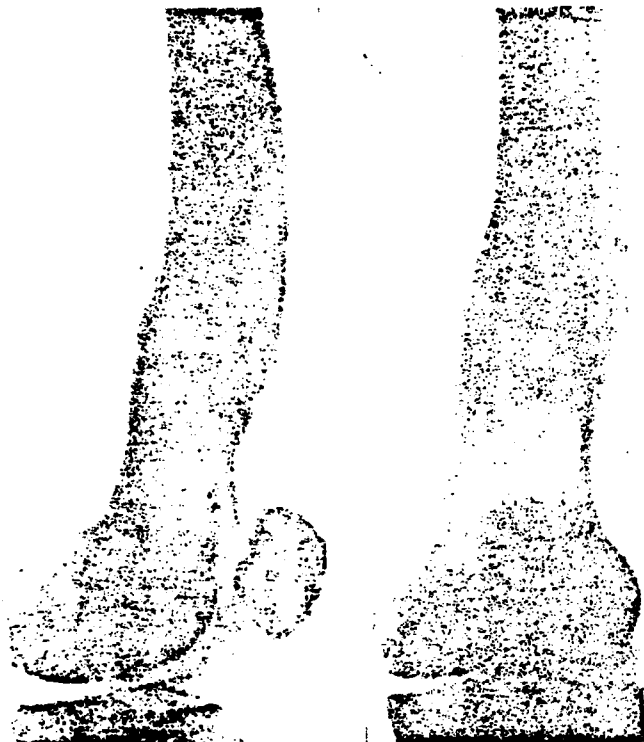


Fig. 52. The same injured person. X-ray photograph 4 years after injury.

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The information about the distant results of the resections of the diaphysis of femoral bone, produced in the period of the Great Patriotic War, are very scanty.

Ya. M. Bruskin (1947) reported 46 long traced injured people with the resection apropos of bullet osteomyelitis of tubular bones; in 3 of them through the considerable periods after operation/process there were fistulas, also, in 7 - false joints (without osteomyelitis).

The indefinite information about the distant results after the resections of femoral and shoulder bone reported G. I. Gogiberidze (1946), also, after the resection of femoral bone - I. Yu. Refer (1949).

For studying the distant results of resections by the author it is inspected 183 wounded the thigh from a number of those the histories of disease/sickness/illness/malady of which were undertaken for the development.

The function of extremity in the majority of subjects was reduced. Persons, in which the resection was conducted for the elongation/extent 7-10 cm, fulfill work as the loaders, coal-hewers, stonemasons, they are occupied by sport and transit into tens of kilometers.

87.50/o of persons, inspected on the average 5 years after the resection of the diaphysis of femoral bone, put to use the operated

extremity; 50.70/o of them work without any limitation of functional load; they do not work or is fulfilled the work, not connected with the load of extremity, 12.50/o of subjects.

By an example of a good issue and distant results of resection during the primary processing of bone wound can serve the following observation.

V., 19 years, 25/III 1945 it is injured by bullet into the left thigh. Injury is through with the fragmented break of the diaphysis of bone on the boundary of lower and middle third. During the primary surgical processing on DMP through several hours after injury the wounds are split, superimposed the Diedrichs' splint.

During the same day in PPG the diagnosis is confirmed roentgenologically. During the revision of wounds are discovered the deprived of periosteum ends of the basic scrap, each is exposed on 2.5-3 cm, and the crack of proximal break. All fragments of bone both free, and partially connected with the surrounding soft tissues, are removed as far as possible subperiosteal.

The exposed ends of the basic scrap are sawed. In all it is removed to 7 cm of bone. Periosteum is preserved for entire elongation/extent from the internal surface and partially with

front/leading. With the moderate stretching of extremity is superimposed unlined gypsum bandage.

During the first days after operation/process the temperature oscillated in the limits to  $38^{\circ}$  with leukocytosis 16200. The investigation of the removed from the wounds small pieces of muscles and fragments of bone discovered hemolytic streptococcus. The general state of injured person is satisfactory. To the 10th day after operation/process the temperature was lowered to the subfebrile and further gradually to the normal.

With exception of suppurative flow in the popliteal pit, complications it was not. Flow was discovered and opened on the removal/taking of the gypsum bandage 3 months after operation/process. The length of diastasis between the scrap, which was being determined roentgenologically (Fig. 50) by the 24th day after injury in 7 cm, in the following 2 months was shortened to 5.5 cm. Bone on the course of the preserved periosteum regenerated (Fig. 51).

From the hospital the injured person is discharged with the healed wounds and the joined break  $6 \frac{1}{2}$  months after injury and resection. The shortening of extremity with the extraction was equal to 1.5 cm.

The distant result: the shortening of extremity the same. There are no fistulas and it was not to the examination/inspection during 7 years. Repeated operations/processes it was not. He works by loader. It consists of the football command (Fig. 52).

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The strength of the newly formed bone 7-10 months after resection with the abandonment of diastasis between the scrap is not inferior to the strength of the intergrowth of bone scrap with their direct contact.

As an example is given the following observation.

M, 19 years, it is discharged from hospital on the 7th month after the resection of middle third of diaphysis of that made apropos of the complication of break of osteomyelitis which by resection was not eliminated. Motions in the knee joint of injured foot were restricted in limits of 180-115°.

Emerging the car on the arrival home, injured person slipped and "villages" to the injured foot. Occurred dislocation in the hip

joint, but the regenerate, which substituted the defect of bone for the elongation/extent 3 cm between the resected scrap, on was broken, in spite of the presence in it of sequestrations.

They work without the limitation of physical load after the resection of thigh with the abandonment diastase 53.10/o of those operated and after resections with the junction of scrap - 45.60/o. At the same time in the first group it is counted more than disabled ones, workers only of house (with respect 14.2 and 8.70/o). The latter is explained mainly by the high percentage of the complications of false joint.

False joints, as a rule, were the consequence of heavy injuries with the wide decomposition of bone and, consequently, also periosteum. But the onset of them almost in all injured people is connected also with the sharp/acute or long flowed/occurred/lasted suppurative infection of wounds and with different errors in the technology of operation/process or in the post-operation conduct of injured person.

As an example of the false joint, which arose mainly as a result of the primary decomposition of bone together with the periosteum and the numbness of the bone fragments, which were remaining between the basic scrap, can serve the following observation.

K., 20 years, 21/I 1945 obtained perforating bullet injury into middle third of left shoulder with the breaking up of bone and the damage of radial nerve and the tangential injury of the soft tissues of the right half breast. On DMP he entered in the state of shock. Through several hours after injury were split the wounds, are removed several free fragments of bone, extremity was fixed/recorded by wire splint.

Wounds festered. The general state of injured person is heavy. Temperature oscillated from 38° to 39.2°; were noted the phenomena of hypo-static pneumonia. Was conducted treatment by sulfanilamides, were done the blood transfusions.

2 Weeks after injury is superimposed thoracobrachial gypsum bandage. The state of injured person was improved. Picture of the blood on the fourth week after wounding: Hb 50o/o, eras. 2920000,  $\bar{L}$ . 9800; the leukocyte formula: p. 30/o, s. 61o/o, lymphs. 29o/o, mon. 75; ROE 52 mm an hour.

6 Weeks after injury: Hb 58%; eras. 3,210,000,  $\bar{L}$ . 13,000, leukocyte formula: p. 2%, s. 60%, lymphs 30%, mon.

7o/o, e. 1o/o, ROE 31 mm an hour. Pains in the wound were held. The phenomena of the intoxication of organism and anemia descended very slowly. Leukocytosis grew on.

On the removal/taking of the gypsum bandage 1 1/2 months after

injury are discovered deep granulating wound of arm with abundant purulent discharge. Consolidation was absent. Roentgenologically (Fig. 53) is discovered multi-fragmented break with the considerable defect of bone, shadow of the bone regenerate between the basic scrap of bone it was not determined. Wounds are split. From the suppurative cavity are removed the free and weakly connected with the soft tissues fragments of bone. Are cut the necrotized sharp ends of extremity break. Between the basic scrap is left diastasis of approximately 8 cm. Is superimposed the discharge gypsum bandage.

During the first days after operation/process the temperature rose to 39°, but on the 4th day it was lowered to the subfebrile, and to the 6th - to the normal. The state of injured person was satisfactory. On the 3rd week after resection the picture of the blood: Hb 57o/o, eras. 3,180,000, 1. 8800, p. 20/o, s. 73o/o, lymphs. 22o/o mon. 1o/o, e. 2o/o; ROE 25 mm. an hour. Through 3 more weeks: Hb 76o/o, 1. 7,100, p. 4o/o, s. 62o/o, lymphs. 27o/o, mon. 3o/o, e. 4o/o; ROE 16 mm an hour.

Upon the exchange of gypsum bandage it was revealed/detected that the consolidation as before is absent; there were fistulas. In the X-ray photographs 24 days after resection (Fig. 54) is visible the regeneration of bone only at the ends of the scrap, between which were arranged/located small dead bone fragments. The left during the resection in the contact with the bone living fragment of the external edge of proximal break begot.



Page 360a.



Fig. 53.



Fig. 54.

Fig. 53. K., 20 years. X-ray photograph 6 weeks after injury. There is a considerable defect of left shoulder bone.

Fig. 54. The same injured person. X-ray photograph 24 days after resection.

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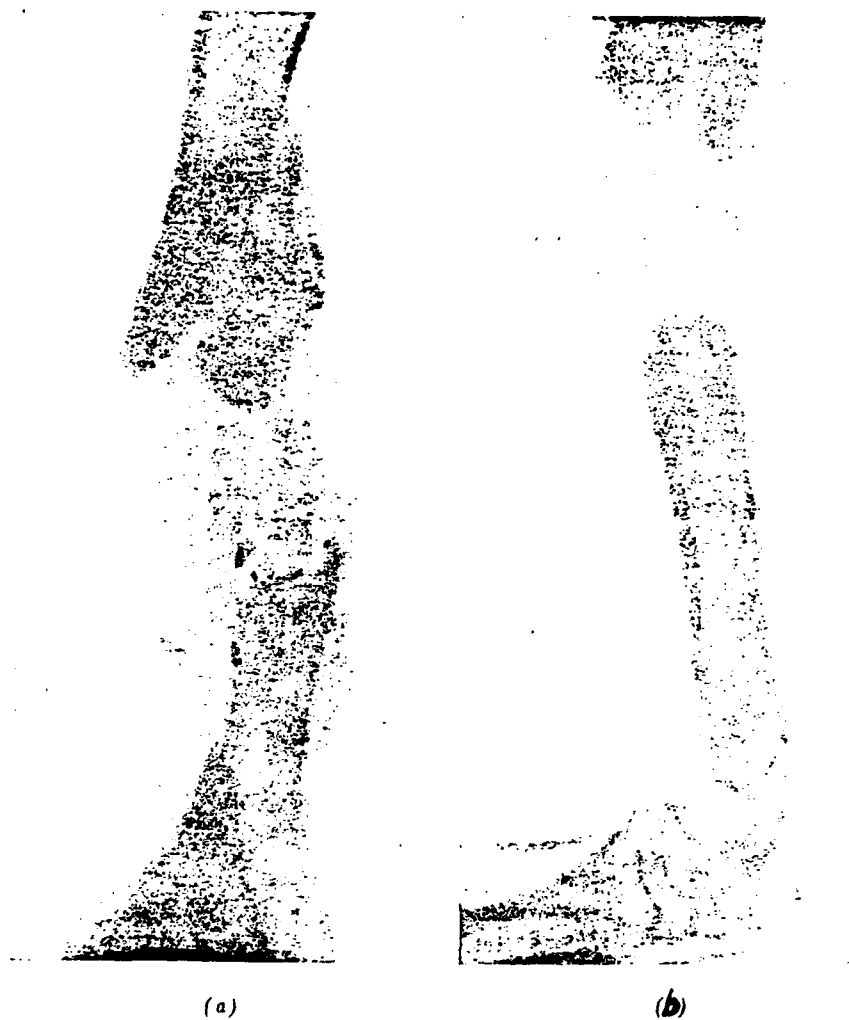


Fig. 55. The same injured person. In 7 months after injury (a) and in 1 1/2 months (b) after repeated reaction.

Page 360c.



Fig. 56. Then injured person. 8 Months after injury.

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4 Months after resection the injured person is operated

repeatedly. The sequestered bone fragments are removed. Ends of proximal and extremity break are cut. Fistulas after this were closed, but bone during diastasis in 6 cm did not regenerate (Fig. 55a and b).

Injured person is discharged from hospital (almost 7 months after resection and more than 8 months after injury) in the satisfactory state with the healed wounds, without osteomyelitis, but with false joint of shoulder and paralysis of radial nerve (Fig. 56).

After the resections, completed by the junction of scrap, false joints it was less, but was observed more than the complications of osteomyelitis, limiting ability to work operated and forcing to search for them the lightened work.

Frequently the presence of osteomyelitis within the distant periods after resection was directly connected with the incomplete removal/distances of the become numb sections of bone with the abandonment of foreign bodies in the zone of regenerate and the traumatization of bone with its cutting with cutting pliers.

Cutting of the ends of the scrap rarely caused large cracks and sequestration of considerable according to the sizes/dimensions fragments. Usually after cutting was noted the onset of the multiple

fine/small sequestrations, which were being partially torn away together with pus into the first three or four weeks after operation/process, partially cut newly formable from the side periosteum tissue. The more it passed time after resection, the greater and the denser became the regenerate, the less it was possible to expect the spontaneous rejection/separation of the sequestrations, included in the multiple fine/small cavities of the newly formed bone. Late operations/processes in such injured people, as it was shown, did not always give necessary effect, especially if such cavities there was much and they were separated between themselves.

Is possible the earlier removal/distance all of the traumatized with cutting and sequestered sections of bone prevented the formation of alveolar/cellular corn and considerably improved the distant results of resection.

The basic reasons for the limitation of ability to work, according to the data of examination/inspection 3-7 years after the resection of femoral bone, they were: chronic osteomyelitis, false joint, shortening of extremity and limitation of motions in the knee joint.

The percent of the complications of osteomyelitis in the course

of time descended as a result both repeated surgical interventions (1/5 all inspected injured people) and self-healing. In 5 years a reduction in the percentage of the injured people, who have the fistulas of thigh, occurred from 27.2 to 15.8.

The shortenings of extremity in the majority of injured people (89.20/o) remained without the changes. The early load of extremity (prior to years after extraction from the hospital) in 10.80/o of injured people caused the strain of the newly formed bone and the shortening of extremity on 1-3 cm.

The volume of motions in the knee joint within the distant periods after resection almost in all injured people considerably was increased and in many (44.70/o) was reduced completely.

False joints among other reasons for the limitation of ability to work within the distant periods after the resection of the femoral bone occupied small places, but the degree of the limitation of ability to work was most great precisely with the false joints. Among the those, who have false joint, 42.80/o were were forced to carry splint, 28.60/o - to walk only with the aid of two crutches; 50.00/o of them do not work or is fulfilled only the work, not connected with the load of extremity.

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With the diagnosis "false joint" it was discharged from hospitals 5.90/o of the total number of injured people to preserved by extremity after the resection of thigh. Almost the same quantity of false joints (5.60/o) was discovered in the subjects 3-7 years after the resection of thigh. Some of that discharged with the false joint reported self-healing of the latter in time from 1 year to 3 years after extraction from hospital, apparently, under the effect of the functional load. In 2 injured false joint it was cured operationally (in one - by osteosynthesis, in another - by the substitution of defect by transplant). But the same number of injured people from a number of those discharged without the diagnosis "false joint" reported the presence in them of false joint. The latter must be set in the relation partly with the errors for diagnosis with the extraction of injured people, partly with the advent of false joints as a result of the early and overloading of the unstrengthened regenerate, that confirm data of examination/inspection.

Issues and distant results of the subperiosteal resections of diaphysis, produced in the Great Patriotic War, make it possible to draw the conclusion that the wide application of this operation/process during the primary surgical processing of bullet breaks is not shown.

Subperiosteal resections it is shown to produce in injured people with the fragmented break of bones, complicated by osteomyelitis and sepsis when in the series/number of injured people resection can replace amputation with the value of the more frequent formation of false joint. Resection is especially shown with osteomyelitis of the ends of basic scrap of one of the paired unsupported bones (fibular, one of the bones of forearm - cubital in lower third, radial - in the upper), when the removal/distance of the affected focus in the limits of clearly healthy/sound tissues can contribute to the rapid healing of wound, but prolonged regeneration of bone will not delay the reduction of the function of extremity.

The best resulting in the relation radicalities of the recovery of osteomyelitis and periods of its treatment gives resection, applied with roentgenologically diagnosed osteomyelitis in the period, beginning from the 4th week to the end of the 2nd month after injury.

The method of processing bone during the resection must be saving, but not cutting of scrap.

The procedure of the treatment of bullet breaks with the



use/application of subperiosteal resection of diaphysis requires further development for the purpose of the decrease of a quantity of post-operation complications by osteomyelitis and the acceleration of the intergrowth of bone without the shortening of extremity.

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Chapter VII.

PSEUDOARTHROSES AND BONE DEFECTS AFTER THE BULLET BREAKS OF THE BONES OF EXTREMITIES.

Doctor of medical sciences R. L. Ginzburgs.

Statistical survey/coverage.

In his dissertation in 1881 the pupil of N. V. Sklifosovskiy, A. I. Kornilov wrote, that the development of false joints, without presenting ordinary phenomenon, to serve faster as exception/elimination from the general/common/total rule and that with the progress of surgery pseudoarthroses will be the greatest rarity or they will disappear entirely.

Perhaps, A. I. Kornilov's optimistic forecasts would justify, but modern wars are mass destructions, which completely corresponds to the name of war by "traumatic epidemic" (N. I. Pirogov).

The contemporary combat technology, which gives severe

forms/species of trauma, the large decomposition of bone, the associated damages of nerves and vessels, the considerable decomposition of soft tissues with subsequent Rubtsov by their regeneration, etc., places the surgeon before the face of new facts, to a certain extent of unknown to senior surgeons.

In the first world war Cuneo (Cuneo) on 10,800 injured people from breaks observed pseudarthrosis in 576 injured people, i.e., in 5.30/o. Tuffie (Tuffie) determined this indicator, based on materials of the first world war, into 14.00/o.

According to the data of the development of the histories of disease/sickness/illness/malady, the frequency of pseudoarthroses after the bullet breaks of the bones of extremities in the Great Patriotic War was the following: shoulder - 5.10/o, the bones of forearm - 3.90/o, thigh - 0.60/o, the bones of shin - 2.50/o; on the average - 3.10/o (see Table 250).

During the comparison of these data with the data of Cuneo and Tuffie (5.3 and 14.00/o) evidently, how Soviet a surgeons advanced in a matter of warning/prevention of pseudoarthroses during the treatment of bullet breaks, in spite of the severity of these damages, caused modern war technique.

The frequency of pseudoarthroses on the separate segments on the whole corresponds to a number of crushed and fragmented breaks, which were the most predominant sources of pseudoarthroses on these segments; furthermore, has a value massiveness and state of the soft tissues, which surround bones, and also anatomical special features/peculiarities of separate bones and segments. Attention is drawn to the high frequency of pseudoarthroses of shoulder, which is caused by the special features/peculiarities of anatomical character/nature.

In the invalids of the Great Patriotic War pseudoarthroses, according to S. M. Reznikov's data, composed 1.7o/o, according to A. T. Lidskiy's data, 2.8o/o and according to M. N. Priorov's data, for upper extremity 1.1o/o and for the lower - 1.7o/o.

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Distribution of pseudoarthroses on the separate segments, based on materials of different therapeutic institutions, was approximately equally (Table 249).

From Table 249, it is evident that the data about the distribution of pseudoarthroses according to the segments on the whole correspond to data of the development of the histories of

disease/sickness/illness/malady. The available deviations are explained by both the shaping of the given therapeutic institutions and by different degree of lack in the treatment of injured people with pseudoarthrosis of the separate bones (in the data of the development of the histories of illnesses are represented all injured people with pseudoarthrosis, and the authors give a number of those needing treatment).

Table 249. Distribution of pseudoarthroses after the bullet breaks of the bones of extremities according to the segments (according to different authors in percent).

(1) Автор	(2) Учреждение	(3) Число боль- ных	(4) Локализация псевдартроза				(9) Всего
			(5) плечо	(6) пред- плечье	(7) бедро	(8) голень	
(10) Р. Л. Гинзбург	(11) Центральный институт травматологии и ортопе- дии . . . . .	232	37,5	25,5	12,9	24,1	100,0
(12) Ф. Р. Богданов	(13) Свердловский научно- исследовательский ин- ститут восстановитель- ной хирургии . . . . .	225	38,7	2,5	14,0	44,8	100,0
(14) Г. Я. Эпштейн	(15) Государственный трав- матологический институт имени Р. Р. Вредена . .	207	42,0	26,0	6,0	26,0	100,0
(16) М. О. Фрид- ланд	(17) Центральный институт усовершенствования врачей . . . . .	(18) Нет сведений			27,0	(18) Нет сведений	100,0
(19) Данные разработки историй болезни . . .		—	30,2	42,2	5,3	22,3	100,0

Key: (1). Author. (2). Institution. (3). Number of patients. (4). Localization of pseudoarthrosis. (5). shoulder. (6). forearm. (7). thigh. (8). shin. (9). In all. (10). R. L. Ginsburg. (11). Central institute of traumatology and orthopedics. (12). F. R. Bogdanov. (13). Sverdlovsk scientific research institute of restorative surgery. (14). G. Ya. Epstein. (15). State traumatological institute im. R. R. Vreden. (16). M. O. Fridland. (17). Central Institute of Continuing Education of doctors. (18). There is no information. (19). Data of development of histories of disease/sickness/illness/malady.

Etiology, pathogenesis and pathological anatomy.

# Basic features of the structure of pseudoarthroses.

A question about the classification of false joints cannot be considered as the finally solved. There are numerous classifications - N. N. Priorova, V. D. Chaklina, V. M. Svyatukhina, G. Ya. Epstein et al. For many authors the widely accepted term "pseudoarthrosis" is the polythalamous concept, which includes all forms/species of the not-grown-together break and defect of bone, with which in the place of break there is no bone coalescence and it does not occur subsequently.

However, should be distinguished: 1) the delayed coalescence, 2) pseudoarthrosis even 3) bone defect.

The delayed coalescence is the process not finished, which still can bring to the coalescence.

It asks itself, with what moment/torque it is possible to consider break as that being not grown together.

Some authors consider that if after 3 months the break is not coalesced, then in practice one should speak about the not-grown-together break.

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But for determining pseudoarthrosis time - most inaccurate indicator. Not injured people, whose process of forming the corn was delayed: break was coalesced in the course of 4-6-8-10 months and it is more. These periods are different in different persons in view of individual conditions, depending on the broken bone, level and form/species of break, character/nature of injury and general state of injured person. The diagnosis of pseudoarthrosis was placed if and only if it was determined that the reduction processes in the place of the former break were interrupted, clinically was established/installed mobility, and on the X-ray photograph - occlusion of marrow canal.

It is accepted to distinguish two basic groups of the not-grown-together breaks.

1. Pseudoarthroses (without defect of bone substance).

According to the character/nature of the tissue, which connects bone ends, they can be: a) fibrous, b) fibrous-chondral, c) joint-like.

2. Bone defects, called by some authors by dangling



pseudoarthroses (K. F. Vegner, E. R. Vreden, E. Yu. Osten-Saken).

With fibrous pseudoarthrosis bone scrap are found almost in the contact (Fig. 57 and 58). Their ends are connected fibrous or scar tissue. Marrow cavity closed cicatrical or bone tissue.

In this case in some injured people on the macroscopic preparation is determined the porosity of bone fragments, is more sharply pronounced on peripheral break. Surface of fracture is covered fibrous tissue. Microscopically at the ends of the scrap evidently insignificant osteogenesis of the thin bone arms, bordered by a small quantity of bone cells. In the marrow spaces - fibrous connective tissue. Places along the line of the break in the cicatrizing tissue scattered the fine/small fragments of the new bone arms, which undergo resorption. In the place of pseudoarthrosis it is noted neither chondral islats nor osteoid tissue.

In other injured people with fibrous-chondral pseudoarthrosis (Fig. 59) in the place of pseudoarthrosis the ends of the scrap sclerosed fragments are connected with each other of fibrous tissue either by fibrous or transparent cartilage. When there is interposition of muscles, the ends of the bone fragments outgrow by the thick layer of cicatrical tissue. From the side of periosteum along the line of break occurs the formation of new bone arms. By the

places in the cicatrizing tissue will bed the islets of osteoid tissue. In the place of the former break in the scar tissue are observed bone arms, around which appears new bone substance. Scar-fibrous tissue, which covers fragments, without forming sharp boundary, loses cicatrical character/nature; in this case are determined the remainders/residues of the atrophying muscular tissue.

With pseudoarthroses of large remoteness microscopic examination detects at the "joint" ends of the bone scrap fibrous cartilage. Around these scrap is formed fibrous capsule with the presence of cavity and similarity of synovial fluid/liquid (Fig. 60). The internal surface of the bag of pseudoarthrosis acquires the properties of the folding, very approaching type synovial membrane.

With the bone defects the space between the scrap is filled scar tissue. The soft tissues, which surround the ends of the scrap, also have cicatrical character/nature. The ends of the scrap are cone-shaped sharpened, sclerosed for larger or less elongation/extent. Marrow canals are closed with scar or bone. The ends of the scrap are connected fibrous tissue, partly coarse-cicatrical character/nature. Cicatrical processes, as a result of the large damage of tissues, are sharply pronounced.

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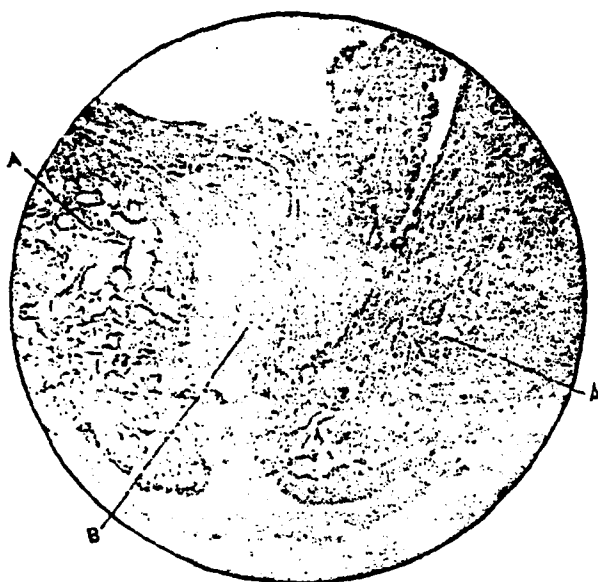


Fig. 57.

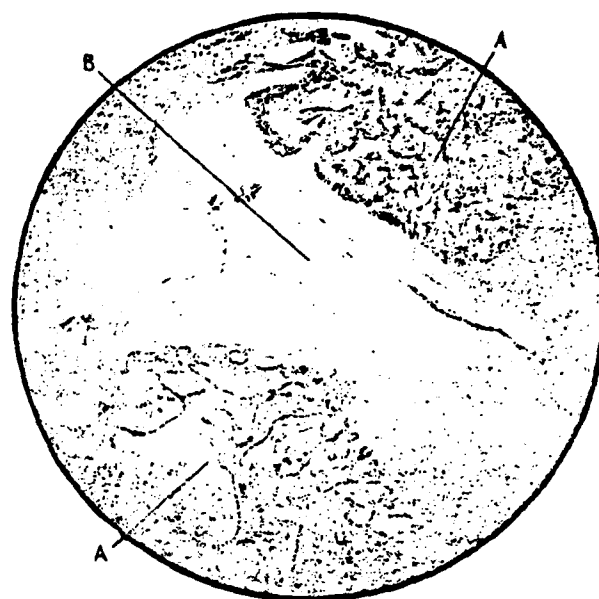


Fig. 58.

Fig. 57. Fibrous pseudoarthrosis of shoulder of biennial remoteness.

A - ends of the bone scrap; B - fibrous layer between them (small increase).

Fig. 58. Fibrous pseudoarthrosis. The same injured person. A - ends of the bone scrap; B - fibrous intersection between them (a great increase).

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Reasons for the formation of pseudoarthroses.

For the coalescence of the break of bullet origin, besides the full-valued nourishment and the general satisfactory state of injured person, is required the observance of three basic conditions:

- 1) early full-valued primary surgical processing;
- 2) early reposition;
- 3) the reliable full-valued immobilization of break to his coalescence.

However, frequently, in spite of a strict observance of these all conditions, coalescence of bone nevertheless it did not occur, since the considerable decomposition of bone, periosteum and surrounding soft tissues led to their necrosis for the large elongation/extent.

In contrast to this in a good state of periosteum and soft tissues and in the absence of the considerable pollution/contamination of wound for the coalescence of the bullet

break of the bones of extremities it was sufficiently satisfactory immobilization.

The form/species of break is the principal indicator of the severity of injury; therefore the frequency of nonaccretion of bone is found in the closest connection/communication with the form/species of break (Table 250).

As can be seen from Table 250, a number of complications of pseudoarthrosis on all segments with the crushed breaks when not only basic, but also other scrap were not contacted between themselves, it was immeasurably more than with all other breaks. The second place occupy fragmented breaks, the third - cross, etc.

Cross breaks, as is known, with difficulty set due to frequency of the reposition of soft tissues and with difficulty they are held after setting.

Thus, the crushed breaks most frequently were not coalesced; however, by some crushed breaks always is impossible to explain the frequency of pseudoarthrosis in the different groups of injured people. It is obvious, there are other conditions, which influence the coalescence of bones.

Table 250. Frequency of the onset of pseudoarthrosis in the various forms of the bullet breaks of the bones of extremities (in the percentages).

(1) Локализация перелома	(2) Вид перелома	(3) Крупно- осколь- чатый	(4) Мелко- осколь- чатый	(5) Раздроб- ленный	(6) Попе- речный	(7) Косой	(8) Про- дольный	(9) В сред- нем
(10) Плечо . . . . .		8,3	5,0	23,5	4,9	4,0	1,2	5,1
(11) Предплечье . . . . .		3,5	5,1	20,6	3,4	2,5	4,6	3,9
(12) Бедро . . . . .		1,0	0,9	3,6	1,1	0,2	—	0,6
(13) Голень . . . . .		3,3	2,9	16,8	4,3	1,9	2,2	2,5

Note. Table 250 the reduced frequency of pseudoarthrosis, obtained after the exception/elimination of those amputated also taking into account those injured people, in who during the stay in the hospital pseudarthrosis was cured. Therefore the data on the false joint (pseudoarthrosis), having clinical issues (chapter XI), with the data of present chapter do not coincide.

Key: (1). Localization of break. (2). Form/species of break. (3). Large-splintered. (4). Small-splintered. (5). Crushed. (6). Cross. (7). By scythe. (8). Longitudinal. (9). On the average. (10). Shoulder. (11). Forearm. (12). Thigh. (13). Shin.

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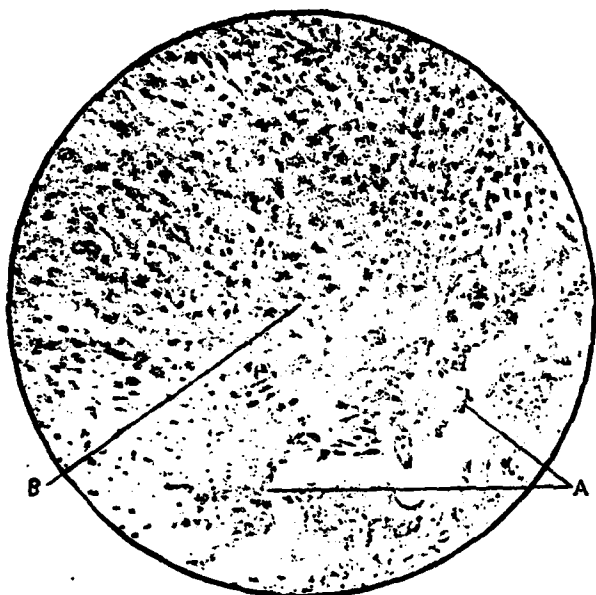


Fig. 59.

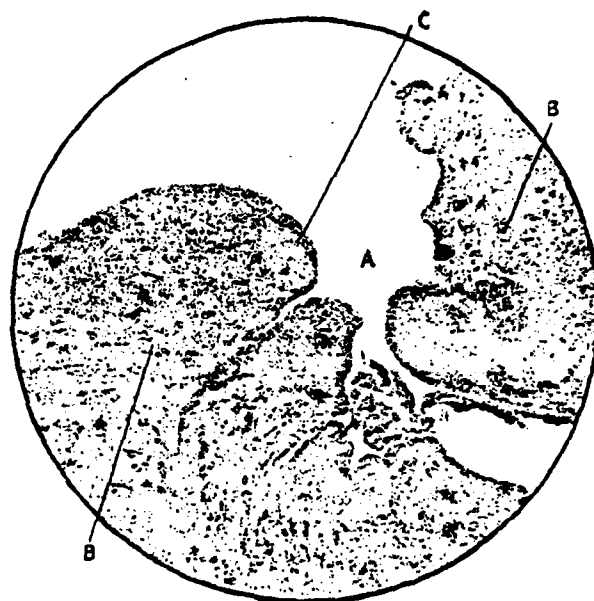


Fig. 60.

Fig. 59. Fibrous-chondral of pseudarthrosis of biennial remoteness. Growth of transparent cartilage at the ends of the bone scrap. A - ends bone of scrap; B - transparent cartilage.

Fig. 60. Joint-like pseudarthrosis of shoulder of biennial remoteness. A - joint slit; B - articular bursa; C - internal pavenent of bag (small increase).

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Thus, for instance, if we analyze the data of Table 251 about the frequency of pseudoarthroses with the bullet and fragmentation injuries, then it will seem that on the upper extremity pseudoarthroses with the fragmentation injuries were encountered more frequently than with the bullet ones, and on the lower extremity - with the bullet ones more frequently than with of fragmentation, although the number crushed breaks on all segments with the fragmentation injuries exceeded their quantity with the bullet ones.

Consequently, in spite of preponderance of the crushed breaks among the fragmentation injuries of lower extremities, pseudoarthroses more often were observed after bullet injuries. It is obvious, the character/nature of the breaking up, produced by bullet and fragment on the upper and lower extremity, is dissimilar. If on the upper extremity the degree of decomposition, contusion and concussion of bone and soft tissues from the effect/action of bullet and fragment differed little from each other, then on the lower extremity as a result of their larger massiveness occurred the more considerable degree of contusion and concussions from the effect/action of bullet, than from the effect/action of fragment.

The character/nature of bone fragments and the degree of



contusion and concussion were different with the breaks of bone at the different levels; it is known that the greatest degree of contusion and concussion of bone was noted with the breaks of diaphysis; therefore most frequently pseudoarthroses were noted with the breaks in middle third (Table 252), although the crushed breaks in middle third were observed more rarely than in extreme thirds (Vol. 15, pgs. 219, 279, 348, 461).

Furthermore, it is necessary to consider that the breaks of upper and lower third of long tubular bones were frequently penetrating into the joints, causing the onset of suppurative arthritis, which led frequently to the amputation.

The frequent reason for nonaccretion of break is the suppurative process, especially prolonged, which is accompanied by osteomyelitis.

Table 251. Frequency of pseudoarthrosis with the bullet breaks of the bones of extremities in connection with a means of injury and a number of crushed breaks (in the percentages).

(1) Локализация перелома	(2) Вид ранения	(3) Пулевое		(6) Осколочное	
		(4) частота псевд- артроза	(5) частота раз- дробленных переломов	(4) частота псевдартроза	(5) частота раз- дробленных переломов
(7) Плечо . . . . .		4,6	15,6	5,9	25,9
(8) Предплечье . . . . .		3,0	9,9	6,1	24,4
(9) Бедро . . . . .		0,7	12,8	0,4	17,4
(10) Голень . . . . .		2,7	14,2	2,4	29,9

Key: (1). Localization of break. (2). Means of injury. (3). Bullet.  
 (4). frequency of pseudoarthrosis. (5). frequency of crushed breaks.  
 (6). Fragmentation. (7). Shoulder. (8). Forearm. (9). Thigh. (10).  
 Shin.

Table 252. Frequency of pseudoarthrosis with the bullet breaks of bones of extremities at the different level (in the percentages).

(1) Локализация перелома	(2) Уровень перелома (по третям)	(3)	(4)	(5)	(6)
		Верхняя	Средняя	Нижняя	В среднем
(7) Плечо . . . . .		4,6	5,7	4,4	5,1
(8) Предплечье . . . . .		2,4	5,0	3,6	3,9
(9) Бедро . . . . .		0,7	0,9	0,4	0,6
(10) Голень . . . . .		1,8	3,5	1,6	2,5

Key: (1). Localization of break. (2). Level of break (on third). (3).  
 Upper. (4). Average/mean. (5). Lower. (6). On the average. (7).  
 Shoulder. (8). Forearm. (9). Thigh. (10). Shin.

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Festering caused weakening the osteogenetic properties of bone scrap and surrounding tissues. Formation of scars in the process of healing also prevented the formation of corn as a result of the disturbance/breakdown of blood circulation.

The complication of osteomyelitis in injured people with pseudoarthrosis on all segments was encountered considerably more frequently than in all injured people; the complication of sepsis was observed almost equally frequently in both groups, while the complication of anaerobic infection in the group of all injured people was observed several times more frequently than in injured people with pseudoarthrosis.

Thus, usual pyogenic infection, it is doubtless, contributed to the delay/retarding/deceleration of bone formation. As far as infection is concerned septic and anaerobic, then to establish/install this was impossible, since with them frequently was conducted the amputation or began death.

Already N. I. Pirogov indicated terminal osteomyelitis as to one of the reasons for the formation of pseudoarthroses with the bullet breaks as a result of the fact that both ends touch each other by the become numb surfaces.

To osteomyelitis as to one of the basic reasons for the onset of false joint indicated G. Ya. Epstein. P. R. Bogdanov found unliquidated osteomyelitis with pseudoarthroses in 45.80/o of injured people.

Z. obtained the perforating bullet injury of right thigh with the break of bone in June 1942. The input and outlets of wound were small. After the injury of primary surgical processing it was not conducted. Injury was complicated by the gas phlegmon apropos of which were made multiple sections/cuts. Prolonged festering with osteomyelitis of the ends of the scrip led to failure to heal of break.

With septic osteomyelitis it was necessary to make subperitoneal resection, although it led subsequently to the formation of large defect. But surgeon consciously employed this operation/process in order to save extremity and to avoid amputation, hoping for the reduction of bone by periosteum or to the fact that the defect in the contemporary state of restorative surgery can be corrected by

osteoplastic operation/process.

As an example is given the following observation.

O. is injured 22/IV 1945 by the fragment of projectile into the right forearm. Is produced primary surgical processing with the dissection of wound. 8/V 1945, after the admission of injured person into the evacuation hospital in the X-ray photograph (Fig. 61) is discovered the fragmented break of right radial bone. Is superimposed anechoic gypsum bandage to the right forearm.

Table 253. Frequency of infectious complications in injured people with pseudoarthrosis and in all injured with the bullet break of bones extremities (in the percentages).

(1) Локализация перелома	(2) Группа раненых	(3) Осложнение			(6)
		остео-миелит (4)	сепсис (5)	анаэробная инфекция	
(7) Плечо	(8) С псевдартрозом . . . . .	64,3	1,2	1,2	
	(9) Все раненые . . . . .	39,3	1,0	5,0	
(10) Предплечье	(8) С псевдартрозом . . . . .	55,6	0,3	1,5	
	(9) Все раненые . . . . .	25,2	0,2	2,1	
(11) Бедро	(8) С псевдартрозом . . . . .	34,9	7,0	2,3	
	(9) Все раненые . . . . .	31,1	9,5	12,3	
(12) Голень	(8) С псевдартрозом . . . . .	78,0	2,2	3,8	
	(9) Все раненые . . . . .	41,8	2,2	10,0	

Key: (1). Localization of break. (2). Group of injured people. (3). Complication. (4). osteomyelitis. (5). sepsis. (6). anaerobic infection. (7). Shoulder. (8). With pseudoarthrosis. (9). All injured people. (10). Forearm. (11). Thigh. (12). Shin.

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Injured person is converted into the central institute of traumatology and orthopedics. In the X-ray photograph from 19/VI in the region of the edges of scrap of radial bone are discovered destructive changes with the separate bone fragments. On the radial edge of the ulna at the same level was determined the scaled periosteum. On the rear of forearm it is equal by the size/dimension 9x2 cm. On the bending surface wound by the size/dimension 3x2

cm with the necrotic coating.

28/VI apropos of osteomyelitis to injured person under the local anesthesia 180 ml 0.5o/o novocaine) is produced the operation/process: by longitudinal passing through the fistula section/cut on the right forearm exposed the place of break is produced subperiosteal resection of proximal and extremital fracture of radial bone. Wound is washed below chloramine and is filled by streptocide. Are superimposed catgut sutures to the skin. Anechoic gypsum bandage to the middle of shoulder. Post-operation course is smooth.

Injured person is discharged 12/XI 1945 home with the healed wounds and the defect of radial bone in 12 cm (Fig. 62) (see also the example, given on pg. 389).

During the Great Patriotic War among the measures for warning/prevention of pyogenic infection principal place was assigned to primary surgical processing. Therefore it is very important to establish/install, what interrelation existed between the primary surgical processing and the onset of pseudoarthrosis; this can be seen from Table 254 (data of the development of the histories of disease/sickness/illness/malady).

From Table 254 it is evident that in the absence of processing or with its simplest character/nature was observed a small number of complications of pseudoarthrosis, and with more complex character/nature of processing - great. This to a considerable degree is explained by the fact that the more complex processing usually corresponded to the heavier breaks (Vol. 15, pg. 153, etc.). The experiment/experience of the Great Patriotic War is shown also that the excessively radical removal/distance of bone fragments and the resection of basic scrap frequently contributed to the formation of pseudoarthroses. This is completely confirmed many times by a large number of pseudoarthrosis after the removal/distance of bone fragments and processing of fragments in comparison with other means of processing.

Excessive radicality during the primary processing is undesirable especially because the commotion and circulatory necrosis in the soft tissues they are revealed/detected not earlier than the end of the first day, but in the bone - on the 3-4th day. "To the period indicated the morphological signs of necrosis both with the macroscopic and during the histological investigation were not detected" (A. V. Smol'yannikov, Vol. 15, pg. 177). In such a situation any excessive manipulations in the wound during the primary processing are not recommended.



Table 254. Frequency of the formation of pseudoarthroses with bullet fractures of the bones of extremities in connection with the character/nature of primary surgical processing (in the percentages to a number full/total/complete breaks).

(1) Локализация перелома	(2) Характер обработки	(3) Рас-сече-ние	(4) Рассече-ние и ис-сечение	(5) Рассечение и иссечение			(6) В среднем	
				(7) с удале-нием костных осколков	(8) с обработ-кой фраг-ментов кости	(9) с другими элемен-тами	(10) после обработки	(11) без об-работки
(12) Плечо . . . . .		3,3	5,1	12,9	34,6	2,2—7,3	5,5	4,8
(13) Предплечье . . . . .		2,4	5,2	9,4	16,7	2,5—13,8	4,2	3,6
(14) Бедро . . . . .		0,7	0,8	1,6	5,0	—	0,6	—
(15) Голень . . . . .		2,6	5,2	7,0	21,0	3,2—5,2	2,6	2,0

Key: (1). Localization of break. (2). Character/nature of processing. (3). Dissection. (4). Dissection and carving. (5). with removal/distance of bone fragments. (6). with processing of fragments of bone. (7). with other elements/cells. (8). On the average. (9). after processing. (10). without processing. (11). Shoulder. (12). Forearm. (13). Thigh. (14). Shin.

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Already N. I. Pirogov cautioned from the resection during the primary processing, indicating that "Langenbek in the first Holstein war made the vast resections of diaphysis and drove out all crushed by bullet parts of the bone so that after saving left two ends with

the even and parallel surfaces. But bone, as a result of the decomposition of periosteum, was not renewed as in the necroses, and the connected with the operation/process violence acted detrimentally". Over that in those recovered after resection both in Holstein and in Italy the bone was not always renewed and the sending of term was then disrupted. Instead of the bone was probed on the healing of wound fibrous cord/bead. Therefore I will not regret, that it did not test in the Crimean War to resect diaphysis". "... in the early operations/processes, periosteum you will almost always find by that contused, torn, and, mainly, separated from the soft parts".

In the majority of injured people the removal/distance of fragments was dictated by need, but sometimes it was conducted without the sufficient bases and it is too wide. This removal/distance of fragments, especially together with the periosteum, forms the defect of bone and periosteum and it contributes to the lack of healing of break.

As examples can serve the following observation.

D., is injured 15/II 1945 by the fragment of projectile into middle third of left shin with break of both bones. First aid is shown/rendered by the sanitary instructor the hour after injury. On DWP is produced the primary surgical processing of the wound, during

which are removed free bone fragments. Is superimposed the splint of Cramer. In the evacuation hospital are removed metallic fragments. 23/III is produced operation/process for osteomyelitic process. Wound on the front face of shin is expanded: is discovered the breaking up of more than tibial and fibular bone. Are removed free (?) bone fragments.

Wound is filled by iodoform. In the post-operation period - by increase in the temperature to 38.5°, which gradually was lowered to the normal.

15/IV 1945 injured person is converted into another evacuation hospital with the not-grown-together break of the bones of left shin and unsawn wounds.

26/VIII it is discharged with the healed wounds and with the defect of the tibia (Fig. 63).

It is possible to assume that in this injured person was produced the excessive removal/distance of bone fragments.

The absence of timely full-valued reposition, the insufficient immobilization of scrap, its stopping into too the injury periods or even disturbance/breakdown of its continuity for the inspection of

wound and for the dressings, the frequent exchanges of gypsum bandages according to the different occasions also led to the failure of breaks to heal.

I., 35 years, it is injured in 1942 by the fragment of projectile into the right thigh and the right knee joint. Primary surgical processing is produced at DMP. Injured person was treated in the hospitals, long time being located in the gypsum bandage.

After the admission into the Central institute of traumatology and orthopedics during January 1948 was swept aside the sharp strain of extremity in middle third of thigh. Shortening of extremity to 13 cm, ankylosis of knee joint. In the X-ray photograph was determined lack of healing of break due to the considerable displacement of scrap, moreover extremital scrap was displaced towards the inside (Fig. 64).

It is customary to assume that the injury of nerves detains the consolidation of break. Therefore it is necessary to become acquainted with appropriate data of the development of the histories of disease/sickness/illness/malady (Table 255).

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Fig. 61.



Fig. 62.

Fig. 61. O., is injured 22/IV 1945. Fragmented break of right radial bone.

Fig. 62. The same injured person. Defect of right radial bone after the operation/process of subperiosteal resection apropos of osteomyelitis 2 months after injury.



Fig. 63. D., 30 years. Fragmented break of the bones of left shin in middle third. Defect of the tibia after the excessive removal/distance of bone fragments.

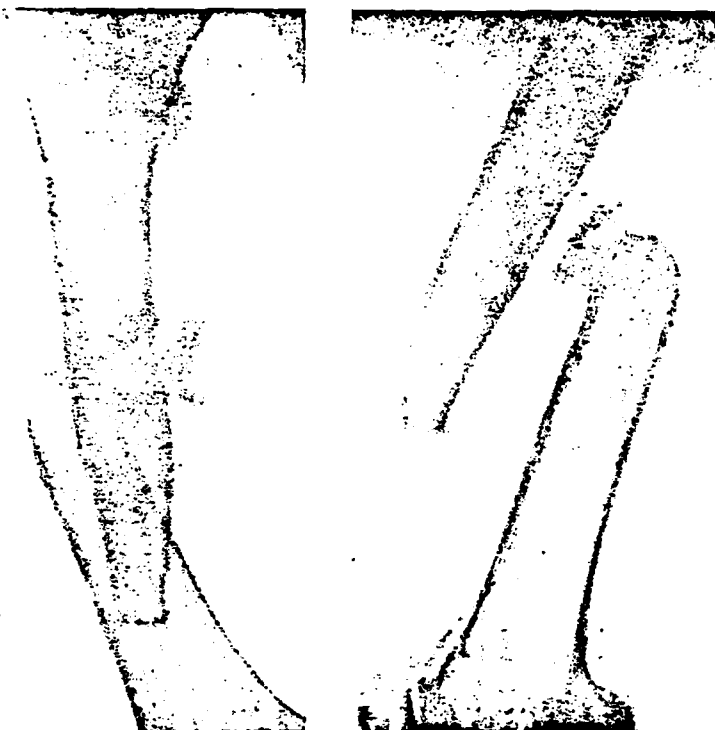


Fig. 64. I., 35 years. Lack of healing of break of right thigh due to the considerable displacement of scrap. X-ray photograph 6 years after injury.

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Among the injured people with pseudoarthrosis was observed a larger number of damages of nerves on the upper extremity (where most frequently was encountered pseudoarthrosis), than in injured people without pseudoarthrosis, the frequency of the damage of nerves on the

lower extremity in these groups of injured people was characterized by the inverse relations: in the group, of the not had pseudoarthrosis, a number damages of nerves predominated. It is possible to consider that the injury of nerves did not have the decisive effect on the onset of pseudoarthrosis in all injured people. However, on those segments where there is a small quantity of soft tissues (shoulder, forearm), in consequence of which the nerves were damaged more frequent and it is more strong, their damage did not remain indifferent for the processes of consolidation.

It was possible to establish/install the more permanent dependence between the onset of pseudoarthrosis and the injury of vessels (Table 256).



Table 255. Frequency of the damage of nerves in injured people with the bullet break of the bones of extremities, which were complicated by pseudoarthrosis, and in injured people, who did not have this complication (in the percentages).

(1) Группа раненых	(2) Локализация перелома	(3) Плечо	(4) Пред- плечье	(5) Бедро	(6) Голень
(7) С псевдартрозом . . . . .		37,0	33,0	4,6	13,2
(8) Без псевдартроза . . . . .		28,0	27,0	9,3	19,6

Key: (1). Group of injured people. (2). Localization of break. (3). Shoulder. (4). Forearm. (5). Thigh. (6). Shin. (7). With pseudoarthrosis. (8). Without pseudoarthrosis.

Table 256. Frequency of the damage of vessels in injured people with the bullet break of the bones of extremities, which were complicated by pseudoarthrosis, and in injured people, who did not have this complication (in the percentages).

(1) Группа раненых	(2) Локализация перелома	(3) Плечо	(4) Пред- плечье	(5) Бедро	(6) Голень
(7) С псевдартрозом . . . . .		4,5	12,9	2,3	8,8
(8) Без псевдартроза . . . . .		3,5	6,1	6,3	4,7

Key: (1). Group of injured people. (2). Localization of break. (3). Shoulder. (4). Forearm. (5). Thigh. (6). Shin. (7). With pseudoarthrosis. (8). Without pseudoarthrosis.

Table 257. The specific gravity/weight of pseudoarthrosis among the clinical issues in injured people with the bullet break of the bones of extremities and the simultaneous injury of vessels and in the injured, not had simultaneous injury vessels (in the percentages).

Группа раненых	(2) Локализация перелома	(3) Плечо	(4) Пред- плечье	(5) Бедро	(6) Голень
(7) С ранением сосудов . . . . .		5,6	8,6	0,1	4,7
(8) Без ранения сосудов . . . . .		4,7	2,6	0,7	2,2

Key: (1). Group of injured people. (2). Localization of break. (3). Shoulder. (4). Forearm. (5). Thigh. (6). Shin. (7). With injury of vessels. (8). Without injury of vessels.

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From Table 257 it is evident that the injury of vessels, which associates break, unfavorably affected the consolidation (see also pg. 30-31). Injured people with the break of thigh appeared to be exception/elimination, because their considerable number with the associated injury of vessels underwent amputation or died.

Clinic and diagnosis.

The presence of stable pathological mobility for the

elongation/extent of diaphysis is the main and permanent sign, general/common/total for all forms of pseudoarthrosis. The degree of this mobility depended on the pathoanatomical form/species of pseudoarthrosis. With the bone defects the mobility was expressed the more strongly, the greater there was the defect between the scrap. Especially sharply it was expressed on the segments of extremities with one bone (shoulder, thigh).

Another clinical sign of pseudoarthrosis was the disturbance/breakdown of the function of extremity, which depended on localization of pseudoarthrosis. The presence of pseudoarthrosis in upper third of radial bone, in lower third of cubital and for the elongation/extent diaphysis of fibular bone did not usually cause the considerable disturbances/breakdowns of functions.

The associated damages of nerves, which were being accompanied by paralyses, contractures of the antagonists, by trophic disorders, trophic ulcers, aggravated the disturbance/breakdown of the function of extremity, especially forearms.

The strain of extremity, called by the displacement of scrap, was fixed/recorded in this position by scars intergrowth. Frequently scars were soldered with the bone and they were ulcerated.

With pseudarthroses, located near joints and accompanied by prolonged festering, frequently was observed the limitation of the mobility of these joints, and sometimes also their ankylosis.

In the radiographic image the form of the ends of the scrap with pseudoarthrosis carried diverse character/nature. In some injured ends of the scrap were sharpened, osteoporoses, in other scrap consolidated, sclerosed, marrow canal was closed for the greater or smaller elongation/extent. Sometimes one of the scrap was curved, taking the form, similar to joint head, and another it took the form of indentation with the well ground surface. At the ends of the scrap were now and then visible the osteophytes of various forms and value.

Roentgenological data in combination with the clinical ones helped to place the diagnosis of the available damage/defeat and to solve a question about the character/nature of surgical intervention.

During the laboratory investigation of patients with pseudoarthrosis of substantial changes in the urine it was not detected. In some injured people after operation/process in the urine appeared the protein as the result of the increased decomposition/decay of tissues and feverish state.

To the operation/process of considerable changes in the

morphology of the blood usually it was not noted. In some injured people with pseudoarthrosis and osteomyelitis were observed the high reaction of settling erythrocytes, certain change in the morphology of the regular/prescribed elements/cells of the blood, shift of neutrophils to the left, which indicated the available chronic inflammatory focus. Injured people with such changes in the blood underwent operations/processes apropos of inflammatory focus, and to the reduction of the normal picture of the blood operation/process apropos of pseudoarthrosis in them was not conducted.

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In the post-operation period sometimes was noted a decrease in hemoglobin of the blood.

In the Central institute the improvements of the doctors (M. O. Fridland) in the blood serum of injured people with pseudoarthrosis to the operation/process found lowering the level of calcium, and after operation/process - its increase.

On the contrary, but to the observations of the central institute of traumatology and orthopedics, quantity of calcium to the operation/process frequently happened to have above norm and after operation/process the majority of injured people descended.

In the Kazan' scientific research institute of orthopedics and restorative surgery (L. I. Shulutko) in patients with the false joint after bullet injuries were discovered the disturbances/breakdowns in the protein metabolism/exchange (reduction in the quantity of albumins, plasma, plasma, increase in the quantity of globulins and fibrinogen and a reduction in the protein coefficient).

Changes of the processes of metabolism/exchange in the organism, including change in the mineral metabolism/exchange, they speak that pseudoarthrosis is not only local disease, but also is accompanied the reactions of entire organism.

#### Treatment.

The treatment of pseudoarthrosis was not limited only to surgical intervention, it switched on entire complex of measures into which enters training injured person for the operation/process, operation/process itself and post-operation conduct of injured person.

Training of injured person included the measures, directed toward an improvement in his general state via the

designation/purpose of sanitation and health treatment, high-energy diets with the high content of proteins (2500-3000 calories per day with 150 g of protein), periodic blood transfusions; the psyche/psychics of injured person was prepared by his familiarization with the character/nature of the forthcoming operation/process and the method of anesthetization. Were revealed/detected and underwent sanitation also inflammatory foci on the skin, in the cavity of mouth and so forth, etc.

The extensive skin scars, soldered with the subject tissues, were cut all over and were replaced via dermal-plastic operations/processes (graft/flap on the pedicle, Filatov pedicle). Especially frequently such operations/processes were conducted with pseudoarthroses of the bones of shin.

The damages/defects of nerves created the need for performing the operations/processes of neurclysis or cross-linking of nerve.

With the impossibility of such operations/processes on the nerve or their failure as the preliminary measure they resorted to tenontoplasty. This more frequently occurred to make with pseudoarthroses of shoulder with paralysis of radial nerve. The absence of healthy/sound muscles considerably reduced chances to the success of bone plastic surgery. Therefore to the operation/process

was fastened muscular tone via massage, therapeutic gymnastics and ergotherapy.

As unconditional reading to the operation/process with pseudoarthrosis served the disturbance/breakdown of the function of extremity. Pseudoarthroses of fibular bone, with exception of the region of joint fork, pseudoarthroses of the ulna in lower third and radial bone in upper third did not cause the perceptible disturbances/breakdowns of function and therefore they were not most frequently reading to the operation/process.

During the selection of injured people for the operation/process was considered the period from the moment/torque of the healing of wound to the operation/process. The shorter this period, the greater there was the danger of the outbreak of the silent infection.

In the literature there are many communications/reports about the outbreak of the silent infection through much time after injury (A. D. Solovov, T. S. Zatsepin, S. S. Girgolav, I. A. Golyanitskiy, B. V. Ognev, M. M. Diterikhs, M. D. Mikhel'man, A. V. Vishnevskiy, O. V. Ponomarev).



Some surgeons (I. N. Gdalevich, G. Ye. Ostroverkhov, I. L. Krupko) tried during the Great Patriotic War to perform the early operations/processes of osteosynthesis, but their experiment/experience proved to be unsuccessful, and the majority of the surgeons (N. N. Priorov, V. D. Chaklin, M. O. Fridland, G. Ya. Epstein, L. I. Shulutkc) arrived at the conclusion that from the moment/torque of the healing of wound to the operation/process the period must be not less than 6-12 months.

The experience of the Central institute of traumatology and orthopedics showed that the proposed previously period in 6 months after the healing of wound should have been lengthened prior to years, since the operations/processes, which were being conducted within the more distant periods, gave the best results.

According to the data of the development of the histories of disease/sickness/illness/malady, early surgical interventions apropos of the delayed consolidation and false joints (3-10 months after injury) were produced with pseudoarthroses of shoulder in 2.90/o of injured people, bones of forearm - in 1.10/o, thighs - in 8.00/o and the bones of shin - in 2.10/o of injured people. Almost in these all injured people after operation/process was obtained favorable result.

As the valuable indicator of the state of injured person served

the radiation/emission of the morphology of the white blood. Increased leukocytosis, lymphocytosis, monocytosis and eosinopenia could be the reflection of the chronic inflammatory process of focus character/nature or available focus of the silent infection.

An increase in local leukocytosis sometimes indicated the presence of the silent infection. However, frequently were observed the opposite phenomena when in the suspected zone the indicators of leukocytosis were below than in the symmetrical healthy/sound region. This could be located in connection with spasm or compression of vessels by scars.

For explaining the presence of the silent infection valuable information gave accurate anamnesis: the date of injury, the duration of festering, the nature of flora (gas infection streptococcus, etc.), period from the moment/torque of the healing of the wound, subsequent aggravations of inflammatory process (as reddening, swelling of scar, measurement of the local and general/common/total temperature of body), detection in the X-ray photograph of sequestrations, osteomyelitic foci, periostitis.

The provocation of the silent infection (by massage, tapping, gymnastics, by irradiation by quartz lamp, by the use/application of diathermy, UHF, by wrapping paraffin or by ozocerite) with the

negative results did not give full/total/complete confidence in the absence of the silent infection. Large results it was possible to await from the biopsy for the histological and bacteriological investigation and from the determination of the reaction of organism to surgical intervention.

In the seedings/inoculations, undertaken from the wound with the operation/process apropos of pseudoarthrosis, almost always was detected the presence of microorganisms even in the absence of a change in the morphology of the white blood.

Special danger presented the encapsulated fragments of the projectiles which during the damage of their surrounding capsule sometimes gave the outbreak of infection.

Therefore from a practical point of view it considered that the immense majority of injured people with pseudoarthrosis had the silent infection - even in those whose methods of study gave negative result. Before the operation/process it was to be gone not to the provocation of infection, but to the fight with it, since provocation caused certain aggravation of infection, frequently which was yielding either clinical or to laboratory account, and operation/process, therefore, occurred under conditions of its activation.

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For dealing with the infection contemporary antiseptics (sulfanilamides) and antibiotics (penicillin, streptomycin, gramicidin), revealed great possibilities.

In the Central institute of traumatology and orthopedics in 1-2 days to the operation/process apropos of pseudoarthrosis were assigned the intramuscular injections of penicillin to 50000 active units after 4 hours; during the operation/process soft tissues around the operating field were infiltrated by the solution/opening of penicillin (100000-200000 active units); in the post-operation period was conducted a 5-6-day course of penicillin therapy; dosage was assigned depending on bacteriological data, obtained during the investigation of tissues and small pieces of bone, undertaken during the operation/process.

The measures of fight with the infection sharply improved results of operation, with exception of rare fasterings with penicillin-resistant flora.

Questions of the treatment of pseudoarthrosis are closely

related with the conditions of the regeneration of bone. Surgeons' different views to the sources of the regeneration of bone and the fate of bone transplant with the transplantation conditioned the use/application of different osteoplastic operations/processes with the aid of auto-homo- and heterotransplant.

In the Soviet literature there are many works, dedicated to experimental resolving of the problem of bone regeneration and bone transplantation (I. I. Bredikhin, A. A. Abrazhanov, I. I. Grekov, V. N. Pavlov-<sup>Sil'vanskiy,</sup> N. P. Novachenko, N. N. Petrov, N. I. Bashkirtsev, N. N. Priorov et al.), and considerable number of works, based on the radiation/emission of clinical material (R. R. Vreden, G. I. Turner, M. I. Sitenko, N. N. Priorov, V. D. Chaklin, N. A. Bogoraz, V. M. Svyatukhin, M. O. Fridland, P. R. Bogdanov, G. Ya. Epstein, L. I. Shulutko, N. P. Novachenko, B. K. Babich et al.).

Proposed as the material for plastic surgery different foreign bodies did not find in the practice of the Soviet surgeons of wide acceptance. These foreign bodies are capable of getting accustomed to, surrounding by cicatrical capsule.

M. O. Fridland in the postwar period for the substitution of the defects of bone created "internal prosthesis", welding of the scrap by clutch made of the high-quality stainless steel.

Transplant from the cow's crescent (D. V. Mysh) applied only S. L. Schneider. Then wide distribution obtained heterotransplant in the form of decalcinated and boiled of the so-called "broth bone".

The method of operation/process with decalcinated bone was studied by I. P. Rozhdestvenskiy, A. A. Abrazhanov, P. I. Modlinskiy.

At the XIX congress/descent of the surgeons G. I. Turner spoke in defense of economical relation to the human bone. During the treatment of pseudoarthrosis he put to use plates from the dead bones (bull bone).

V. A. Oppel' supported G. I. Turner's idea, assuming that the heterotransplant is the specific irritant, which facilitates osteogenesis.

M. I. Sitenko applied plates from the bull bone in the form of lateral splint, L. I. Shulutko - in the form of notched/incised plate. According to their data, fixation material was resolved after it fulfilled its role.

N. P. Novachenko in his experimental work showed that auto-, homo- and the heterotransplant gave in essence the similar picture of vascularization and subsequent processes of resorption and regeneration.

M. B. Fabrikant (1948) reported the successful attempts to replace autoplasty with homoplastic material in the form of the conserved putrid nuclei.

G. S. Bohm produced a comparative evaluation of auto- and heterotransplants. On the basis of the obtained results he made conclusions about the advantage of autotransplantation.

In the Central institute of traumatology and orthopedics was initially applied exclusively the autotransplant, but then tested also different forms/species of heterotransplant (bull, chicken/gallinaceous bone). Subsequently, after foregoing the use/application of a heterotransplant, again they were returned to the autotransplant, since heterotransplants long and with difficulty yielded to the substitution by new bone and did not give the desired results.

Surgeons' majority in the Great Patriotic War recognized that the best form/species of transplant is the autotransplant. However in order to take autotransplant, it was necessary to inflict additional trauma to injured person. Operation/process was technically more complex and more prolonged.

The experience of Central institute traumatologies and orthopedics (1939) showed that in many injured people the autotransplant successfully could be substituted by special form/species homo - or heterotransplant - "pure/clean bone" (os purum).

In his time A. A. Abrazhanov (1900) proposed to subject heterotransplant to physicochemical treatment; in 1938 at the Brussels international congress/descent of surgeons (Orell Sevant) also proposed physicochemical treatment; however, its procedure it did not communicate.

By prolonged and firm experimentation with A. V. Rusakov's consultation for the author of the present chapter it was possible to create "pure/clean bone" of the necessary hardness with the well purified bone canals.

The production of "pure/clean bone" occurred as follows. Was



taken the difficult or bull bone from which first mechanically drove out all soft parts and cartilage, and then under the strong water jet drove out those being in the canals and the slits the blood and bone marrow. Was washed transplant that those, until bone became white and transparent/hyaline. Then transplant they immersed for 12 hours in the running water, after which the remaining protein elements/cells were dissolved in 2-40/o solution/opening of the sodium hydroxide at which the transplant lay/rested days (at a room temperature). In this solution/opening of the sodium hydroxide the ossein is not dissolved.

Further it was conducted the desiccation of transplant in the thermostat, then it in 2 days placed into acetone or 96° alcohol for the dissolution of grease.

After a lapse of the first day the alcohol was replaced by fresh. With processing in alcohol was finished the process of manufacture of transplant.

After each procedure (insertion into the solution/opening of the sodium hydroxide, then into acetone) the transplant thoroughly was washed.

Finished transplants boiled during 15-20 minutes and then they guided to the bacteriological investigation. Transplants stored in

the 1ry form/species, and before the operation/process again they boiled during 15 minutes.

For the taking of autotransplant by almost all surgeons preferably was selected the comb of the tibia (I. K. Spizharnyy, N. N. Napalkov, V. N. Razanov, N. N. Priorov, M. O. Fridland, V. D. Chaklin, F. R. Bogdanov, G. Ya. Epstein et al.).

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The accessibility of this region, the absence of the traumatization of soft tissues, the technical ease/lightness of the carving of bone, the possibility to take the transplant of the corresponding length and thickness, the relative harmlessness of this carving gave all bases to prefer the taking of transplant from the comb of the tibia.

In some injured people as the osteoplastic material they put to use bone (N. N. Petrov, M. O. Fridland, F. R. Bogdanov, A. N. Machabeli).

When was required the specific curvature transplant, it were taken from the comb of iliac bone.

Sh. D. Khakhutov preferred to take transplant precisely in the place of formed pseudoarthrosis, i.e., not of the healthy/sound bone of the skeleton of injured person, but from the pathologically changed section near the false joint, since otherwise between the transplant and the bed was absent the chemical affinity.

M. I. Sitenko, N. P. Novachenko, Sh. D. Khakhutov proposed to cut all over massive thick transplant, with all his layers (periosteum, cortical layer, endosteum and bone marrow) whereas in order to ensure direct and intimal contact with recipient's similar elements/cells.

With the transplant of average/mean thickness was taken only cortical bone plate with the periosteum.

A bone-periosteal transplant which was applied by P. M. Plotkin, did not give immobilization and therefore its use/application could occur only as the supplementary operation/process.

A. V. Martynov and V. M. Pavlov-Sil'vanskiy for the first time focused attention on the fact that the small small pieces of transplant were resolved more slowly than large. N. A. Boboraz and Z. I. Kartashev established that such small transplants more easily vascularize and from the very beginning are set under the best

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conditions of nourishment. Therefore they recommended to take not such thick transplants such as proposed Sh. D. Khakhutov, M. I. Sitenko et al.

N. A. Bogoraz proposed to cut down bone road metal together with periosteum and bone marrow from any bone of organism and, first of all, from the bones, which surround the place of pseudoarthrosis, and to place it in the place of defect.

In recent years of war and in the postwar time some surgeons (N. P. Rupasov, V. P. Zakharzhevskiy, B. Ye. Frankenberg, B. K. Babich) utilized in the form of independent material for the transplantation a porous bone. It performed the role of road metal, but fixation *it* did not provide.

The medical reports of hospitals and institutes, which were being represented into the Ministry of Public Health of the USSR, testify about the considerable diversity of the methods, which were being applied during the treatment of pseudoarthroses and defects of bone.

In essence were applied the following methods of the osteoplastic operations/processes which were distinguished in form, method of imposition and fixation of transplantate: 1)

intra-medullary pin; 2) intra-extramedullar transplant; 3) deposit transplant; 4) applied transplant; 5) movable transplant; 6) transplant in the form of spacer; 7) extra-focus synostosis; 8) transplant on the pedicle; 9) skin-periosteal-bone graft/flap.

Intra-medullary pin. For the intra-medullary pin they usually put to use transplant of the tibial or fibular bone.

M. O. Fridland proposed to put to use the fibular bone whose marrow canal appears as the natural continuation of the marrow canal of the fastened bone. The taking of upper and the functions of extremity, whence was taken transplant.

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V. D. Chaklin did not recommend to put to use fibular bone in view of the relatively greater thickness of cortical layer, which impedes the rapid substitution by new bone. Transplant is taken with the periosteum, and in this case considerable length, so that it would visit up to the sufficient distance into marrow canal of both scrap and tightly were fixed/recorded them. With the defect of bone the intermediate part of the transplant was taken somewhat wider and retained periosteum. The parts of the transplant, which were being introduced into the marrow canal, were freed/released from the

periosteum, otherwise it created in the marrow canal interposition, which led to failure to heal of bone.

Apropos the advisabilities of the use of the bone pin of surgeons' opinion were divided.

N. M. Bolyarskiy, N. I. Krauze, M. I. Sitenko, M. O. Fridland, M. I. Kuslik, M. M. Zazakov et al. were the supporters of the use/application of a bone pin, while K. P. Vegner, N. I. Napalkov, N. N. Petrov, N. N. Priorov, P. G. Kornev et al. were voiced against its use/application, assuming that this pin causes the considerable damage of bone marrow and increases ischemia of bone ends.

However, without the intra-medullary transplant it was difficult to manage during the treatment of those injured people in whom there was tendency toward the considerable displacement of scrap or considerable diastasis between the scrap.

Taking into account the negative moments/torques of applying one intra-medullary pin, V. D. Chaklin introduced the method of intra-extramedullary transplant.

Intra-extramedullary method of bone plastic surgery (according to V. D. Chaklin). Intra-medullary transplant from the cortical layer

of the tibia of healthy/sound shin is taken subcutaneously and is driven in into the marrow canal for the large elongation/extent.

The extramedullary transplant, undertaken thus, only with the periosteum, is placed outside in the prepared bed so that its internal surface would fit closely to the refreshed surface of bone. Both transplants are tightly wrapped by muscles (Fig. 65).

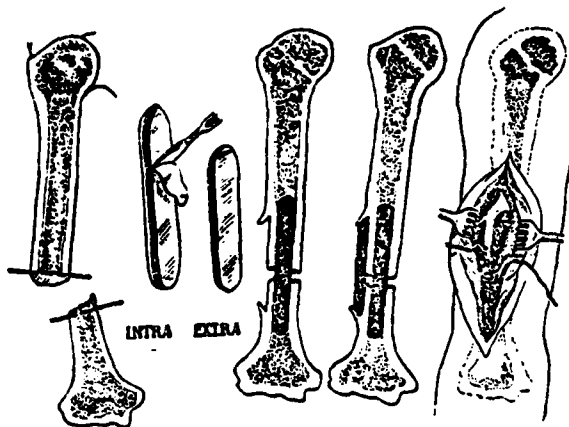


Fig. 65. Intra-extramedullary method of bone plastic surgery according to V. D. Chaklin.

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This method frequently put to use, especially during the treatment of pseudoarthroses and bone defects thighs and shoulder, in the Moscow regional hospital, in the Moscow urban orthopedic hospital No 4, in the clinic of orthopedics and traumatology of the hospital of the name of Botkin, in the Central institute of traumatology and orthopedics, etc.

Deposit transplant. Transplant is sawn from the tibia with periosteum and bone marrow, moreover its size/dimension must correspond precisely to the sizes/dimensions of prepared for each of



the scrap bed. For this edge the saws are arranged up to the distance not less than the sizes/dimensions of the prepared bed.

Then transplant is put in in the prepared bed so that would be contacted the uniform elements/cells - bone marrow, endosteum, cortical layer of transplant and bed and so that after its imposition would be provided a precise comparison of scrap and a good fixation.

Applied transplant switches on periosteum and cortical layer. During the use/application of this form/species of transplant into the contact comes only cortical layer of transplant with the cortical layer of bed.

Applied transplant requires supplementary reliable fixation by screws/propellers made of the stainless steel, "pure/clean bone", Vitallium or wire.

Applied transplant with more difficulty to carry out on the forearm, in lower third, since it is here small soft tissues for occluding the transplant.

The movable transplant, proposed by Sh. D. Khakhutov, is the special form/species of deposit transplant, which frees from the need of depositing the trauma for healthy/sound foot. By motor saw from

each fragment they saw two transplants, moreover longer transplant they saw longer fragments. Thus it is prepared to gunstock for the transplant.

Longer transplant they place above the slit or the bone defect, and to the remaining part of the bed they place shorter transplant so that the healthy/sound ends, i.e., contradictory/opposite to the place of pseudoarthrosis, would arrive into the mutual contact.

Sh. D. Khakhutov attached much importance to the carving of transplant in the region of pseudoarthrosis, considering that between the transplant and the maternal bed is a "chemical affinity".

This form/species of transplant widely and successfully can be used for pseudoarthroses of the bones of shin.

Transplant in the form of spacer was proposed by R. R. Vreden and M. I. Sitenko; him applied and recommended G. Ya. Epstein, N. P. Novachenko, I. Ye. Kazakevich with pseudoarthroses and defects of femoral and shoulder bone.

Basic transplant is placed in the form of lateral splint, and "transplant-spacer", accurately corresponding to diastasis, between the refreshed scrap of fragments. After the imposition of lateral

transplant and spacer is obtained the continuous bone pons, which connects the scrap between themselves, the spacer completing the defect between them.

Extra-focus synostosis was introduced in to practitioner P. R. Bogdanov in 1943 and was applied by it with the defects of the tibia with the presence of those soldered with the subject scar tissues in the place of pseudoarthrosis, not given the possibility to close wound after the operation/proccass of the free transplantation of bone.

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With this procedure with the aid of bone-periosteal plate was reached the intergrowth between the upper divisions of tibial and fibular bone and between the basis of external malleolus and lower metaphysis of the tibia. Transplant they take from the same tibia. The cross shear/section of its quadrangular or several oblong form. In the large and fibular bone above and below the places of pseudoarthrosis in the transverse direction slot with respect to the sizes/dimensions of transplant. Into the slots/grooves the transplant is inserted perpendicular to the axis of extremity. Thus, osteoplastic operation/process occurs out of the region of pseudoarthrosis.

During the reduction of bone the load of extremity by means of the bolts is transferred with the tibial to the fibular bone which subsequently considerably is thickened.

Transplant on the pedicle [operation/process Ghana (Hann)]. With this operation/process is conducted the replacement of the defect of

the tibia by transplant from the fibular bone. First is done the osteotomy of fibular bone. Extremital scrap of fibular bone is inserted either into the marrow canal of the tibia, or it is placed into the shallow trough, knocked out on the surface of combinable saws.

Good results with this operation/process obtained N. N. Priorov, S. D. Ternovskiy; P. R. Bogdanov reported 21 successfully carried out by it operation/process. A deficiency/lack in this method he considered the possibility of the traumatization of fibular nerve.

Positive results with the operation/process must be referred due to a good transplant whose one end remains under conditions of normal existence and retains the large part of its blood supply. The reduction of bone occurs faster than with the free bone transplantation where it must occur revascularization of transplant. Even during the festering the displaced fibular bone is better resisted infection.

However, with the defects of bone as a result of bullet damages fibular bone is fragile support for the load of body as a result of insufficient thickness and the incapacity to the considerable thickening subsequently, and also as a result of the disturbance/breakdown of the axis of extremity with respect to the

talocrural joint. Especially this had a value in the absence of another extremity.

M. S. Zhukhovitskiy introduced useful modification into the mentioned operation/process. With the large defect of the tibia he introduced after osteotomy extremital scrap of fibular bone into the proximal scrap of tibial.

Extremital and proximal scrap of the tibia this author additionally connected by the autotransplant, undertaken from the comb of the tibia of healthy/sound foot. The grafted/transplanted autotransplant served simultaneously as rafter and spacer and was soldered with the fibular bone. Was obtained excellent result in functional sense in the sense of support, retention/preservation/maintaining of the correct axis of extremity and motions in the talocrural joint.

This operation/process was shown when a sufficient quantity of unchanged soft tissues and preserved function of talocrural joint is present,.

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G. A. Il'in in 1925 performed operation/process on the forearm

on the same principle - it replaced the considerable defect of radial bone by the undamaged/uninjured ulna. He proposed to produce the osteotomy of the ulna at the level of peripheral break of radial and the end of central break of cubital to insert in the marrow canal of peripheral break of radial bone.

Skin-periosteal-bone graft/flap was for the first time applied in the test for animals by Russian surgeon Yu. Kosmovskiy in 1873. Graft/flap cut out itself in the neighborhood and was turned on the pedicle from the soft tissues. Bone graft/flap cut out itself so that it would remain in the junction with the soft tissues, and the latter in turn, had to have sufficient width a pedicle.

P. I. D'yakonov produced the transplantation of bone graft/flap in the junction with the soft tissues from the front, after repeating the operation/process described above on the skull.

In the Great Patriotic War N. N. Blokhin utilized with the considerable defects of radial or ulna a section of edge/fin on the wide musculocutaneous pedicle. With the defects of radial bone he cut out graft/flap with the basis on top, while with the defects of the ulna - with the basis from below.

Forearm supply to the chest (usually is taken the VII or VIII

edge/fin), graft/flap place to the wound forearms, so that the resected edge/fin would lie into the defect of bone. The size/dimension of the resected edge/fin must correspond to the sizes/dimensions of defect in order to avoid bias. Edge/fin is sewn in the region of the ends of the defect for the periosteum by two-three catgut sutures. Skin graft/flap is sewn to the edges of skin defect.

A. G. Lapchinskiy with the extensive defects of the tibia of the bullet origin and extensive deep Rubtsovs changes in all tissues, which surround break, proposed instead of the operation/process of the free transplantation of bone to produce the transplantation of bone on the feeding muscular pedicle. After the refreshment of the bone fragments of one of them, that of most covered with muscles, they take transplant together with his covering periosteum. Transplant remains to hang on the surrounding muscles, connected with them by its periosteum. Bone transplant is moved, filling the zone of defect, moreover its connection/communication with the soft tissues is not disturbed.

Transplant is hemmed to the surrounding tissues by catgut sutures. This method differs from the method of movable (slipping) transplant in terms of the fact that is taken not the free bone transplant, but the transplant, fixed on the muscular feeding



pedicle.

Internal fixation technique of scrap and transplant had high value. With the coalescence of break one of the main factors was a good contact of scrap and a good blood supply. This position is even more applicable to the operations/processes of bone plastic surgery, since in the ischemic fragments of pseudoarthrosis are considerably lowered/reduced stimulating moments/torques of osteogenesis.

To avoid the risk of the bias of scrap and sliding of transplant after operation/process bone fragments and transplant must be immediately well fixed/recorded. If reliable fixation it is not obtained, then are possible light motions and muscular tensions and, thus, is created the danger of damage in the young growing tissue. In such injured people frequently was obtained unsatisfactory result even in the presence of full/total/complete external fixation with the aid of the gypsum bandage.

Experiment/experience shows that the surgeon, employing during the treatment of pseudoarthrosis all available at his disposal mechanical means, compensates thus the deficiency of physiological reaction.

The immobilization of break and grafted/transplanted transplant pursued the double target: 1) to hold down/retain scrap and transplant in the contact; 2) to shield the young growing tissue from the damage. Gypsum bandage served the first purpose, but it was frequently insufficient for the second.

One of the main reasons for nonaccretion of bones was unsatisfactory immobilization with the operations/processes of bone plastic surgery.

Hence occurred both the propositions of different methods of osteosynthesis and the striving of surgeons to find the methods of fixation of scrap in the necessary precise contact: metallic wire, metallic plates from the stainless steel or Vitallium, plate from the "pure/clean bone", probe made of the stainless steel of M. O. Fridland.

One should also mention about the proposed in 1912 by I. K. Spizharn method of intrasosseous/intraosteal/endoosteal pinning, which was being applied by V. I. Razumovskiy. This method extensively is used abroad by the name of the method of Kuntscher (Kuntscher). In the Soviet Union during the Great Patriotic War the method of

intraosseous/intraosteal/endoosteal pinning applied M. N. Akhutin and subsequently developed Ya. G. Dubrov.

The positive value of nailing consisted in the safeguard of fixation and form of extremity; as reading to its use/application can serve the fresh closed breaks of thigh.

The more restrained responses were encountered in the literature, dedicated to treatment by the method of nailing of pseudoarthroses of bullet origin. Was indicated the possibility of the onset of the complications of osteomyelitis and nonaccretion of break.

For the attachment of scrap of M. I. Sitenko and N. N. Burdenko they put to use silver wire.

A. I. Apasova and M. M. Kazakov established the harmful effect of some metals: the latter caused the phenomena of the rarefaction/evacuation of bone tissue in the place of their application for the fixation. Therefore it was proposed high-grade steel and completely inert alloys, which do not entail stimulation in the tissues.

As this inert alloy V. V. Troitsky (1939) proposed the alloy

"osteosynthesitis". This is pure magnesium, to which for the strength is added an insignificant quantity of cadmium.

The method of application of a magnesium plate in no way differs from the procedure of the use/application of other plates; its fixation is conducted subperiosteally by screws/propellers from the same alloy. It is sufficiently strong/firm in order to fix/record bone scrap of forearm and shin with the breaks of one bone, but it is insufficiently strong/firm for the fixation of the break of thigh and shoulder.

In the literature there are communications/reports (M. S. Znamenskiy) about the favorable results of applying osteosynthesitis for the fixation of bone scrap during the treatment of the invalids of the Great Patriotic War.

In the central institute of traumatology and orthopedics was carried out the experimental investigation of plates from the plastic (polymethyl methacrylate) for the purpose of the check of the possibility of their use/application with the orthopedic operations/processes; by them was achieved/reached a good fixation and immobilization. No phenomena of the rarefaction/evacuation of bone tissue or delay/retarding/deceleration of osteogenesis was noted.

The bone plate from the "pure/clean bone", which calls no stimulation in the place of transplantation, sufficiently strong/firm in order to reliably hold bone scrap, slowly resolving, and it was in view of this a good fixing plate. Simultaneously it serves as the source of calcium salts.

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To the operation/process they are prepared: 1) bone plate from the "pure/clean bone" of required dimensions and form; at both ends the plates are bored on two openings/apertures; 2) two screws/propellers from the "pure/clean bone" with the cutting of the corresponding length; 3) bit is somewhat smaller (than screws/propellers) diameter for the drilling of openings/apertures on each of the bone fragments; 4) the screw tap, which corresponds according to the diameter to the cutting of bone screw/propeller.

Fixation of scrap with the aid of the plate and the screws/propellers from the "pure/clean bone" is conducted as follows (Fig. 66a, b and c): bone plate is laid on the isolated, refreshed and comparable bone fragments and on its openings/apertures are planned future openings/apertures in the bone fragments.

Bone plate must be held by bone terminals.

Then the first outer opening/aperture on one of the fragments is bored by drill, by screw tap is done cutting, after which screws itself the first screw/propeller. Only after this accurately is planned and are bored three following openings/apertures, and plates firmlyly it is screwed to the scrap how is achieved very good and reliable fixation of scrap.

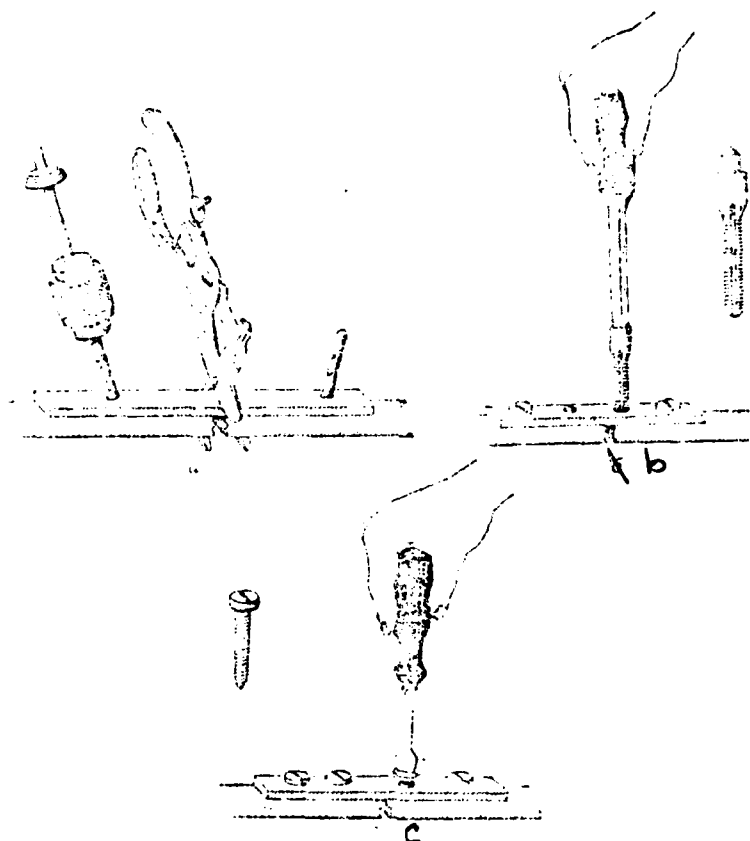


Fig. 66. Osteosynthesis technique by plate from the "pure/clean bone". a) by electric drill are made openings/apertures in the plate and in the bone fragment; b) by the screw tap, which corresponds to the diameter of drill, is done cutting in the plate and in the bone fragment; c) fixation of plate from the "pure/clean bone" by screws/propellers from the "pure/clean bone".

The advantage of bone plate and bone screws/propellers lies in the fact that subsequently is not required to drive out them.

In the central institute of traumatology and orthopedics as the reliable fixers successfully were applied the plates from the "pure/clean bone".

In 780 injured people with pseudoarthrosis, treated in this institute, depending on pathoanatomical and clinical picture, and also localization for the different types of pseudoarthroses it was necessary to apply different methods of surgical intervention.

The procedure of the surgical treatment of pseudoarthrosis of thigh, supporting-motor organ/control with one bone imposed the special requirements of support, retention/preservation/maintaining of normal axis and length of extremity and differed from the surgical treatment of pseudoarthroses of the shoulder, which has another function where a precise retention/preservation/maintaining of length and form of extremity does not have this value.

With pseudoarthroses of shin, supporting-motor organ/control with two bones, were proposed the corresponding methods of



operations/processes. During the treatment of pseudoarthroses of forearm also it was necessary to consider the special requirements depending on damage/defeat by one or both bones, from the level, and also from the character/nature of damage/defeat. In accordance with this was developed the specific procedure of the treatment of pseudoarthroses for each division of extremity.

#### Issues.

According to the data by previous the statisticians N. N. Petrov, of 20 injured people with the false joint after bullet break in 12 were noted unfavorable results. N. P. Novachenko on the basis of the experiment/experience of the Great Patriotic War indicates that the coalescences after operations/processes apropos of false joint did not begin in 46.00/o of injured people.

M. O. Fridland in the first years after war reported 45.00/o of failures, I. S. Zhorev - about 60.00/o.

Table 258. Results of the treatment of injured people with pseudarthrosis after the bullet break of the bones of extremities in the therapeutic institutions of individual republics and regions in the postwar period (in the percentages).

(1) Республика или область	(2) Год	(3) Исход			(7) Итого	(8) Опериро- вано	(9) Средние сроки лечения (в днях)
		(4) выздо- ровело	(5) выписано с улучше- нием	(6) выписано без улуч- шения			
РСФСР . . . . .	1946	20,6	49,1	30,3	100,0	38,4	74
(10) Украинская ССР . .	1947	20,7	48,6	30,7	100,0	47,4	106
	1946	22,3	53,4	24,3	100,0	49,2	103
(11) Белорусская ССР . .	1947	19,2	47,9	32,9	100,0	40,6	101
(12) Грузинская ССР . .	1946	12,3	50,7	37,0	100,0	38,4	49
(13) Московская область	1948	11,7	50,8	37,5	100,0	13,4	23
(14) Львовская область	1946	25,4	46,1	28,5	100,0	33,7	72
(15) Чкаловская область	1946	5,2	80,0	14,8	100,0	22,2	161
(16) Кировская область	1946	25,0	50,9	24,1	100,0	42,2	49
(17) Молотовская область	1946	46,9	47,7	5,4	100,0	34,9	106
(18) Ленинград . . . . .	1946	13,9	68,3	17,8	100,0	1,9	51
		8,1	74,1	17,8	100,0	89,7	86

Key: (1). Republic or region. (2). Year. (3). Issue. (4). it recovered. (5). it is discharged with improvement. (6). it is discharged without improvement. (7). Altogether. (8). It is operated. (9). Average periods of treatment (in days). (10). Ukrainian. (11). Belorussian. (12). Georgian. (13). Moscow region. (14). L'vov region. (15). Chkal region. (16). Kirovskaya district. (17). Molotov region. (18). Leningrad.

operations/processes apropos of pseudoarthrosis in 75 cases obtained good results.

According to the communication/report of chief surgeon - the orthopedist of the Ministry of Public Health of the USSR D. K. Yazykova, in 3 years (1946-1948) from the institutes and the hospitals it was discharged with satisfactory result of 70.00/o of injured people afterward conservative and surgical treatment apropos of the not-grown-together break of the bones of the extremities of bullet origin.

The issues of treatment in different hospitals and institutes oscillated over wide limits (table 258).

On given by D. K. Yazykov data of different authors of 12 therapeutic institutions, the percentage of unsuccessful results after osteoplastic operations/processes oscillated in limits of 16.0-30.0. Fastening the authors observed in 12.0-20.00/o of injured people.

#### PSEUDOARTHROSES AND BONE DEFECTS OF SHOULDER.

The reason for the formation of pseudoarthroses of shoulder in middle third was predominantly worse blood supply of this region in

connection with the fact that on the front/leading and internal surface of middle third of shoulder the considerable bundles of muscles were fastened not directly to the bone, but they are thrown above it in the form of pons, and only on the posterior surface of middle third of shoulder is a small strip of fastening caput laterale m. tricipitis brachii, also, on the external surface the fastening of filaments m. deltoideus et m. brachialis.

Another reason for the formation of pseudoarthroses of shoulder in middle third - interposition of muscles. The muscles, which are thrown in the form of pons, at the moment of trauma with the bias of scrap easily were pinched between the scrap. If at the moment/torque the repositions of muscle were not freed/released, could begin nonaccretion of break.

The cross breaks, with which of the number of unsplintered reduction of bone occurred more slowly, especially with their localization in middle third, required a precise anatomical comparison of scrap and prolonged immobilization.

The superimposed "suspended" gypsum bandage without the reinforcement on the discharge splint by its severity also could cause overdistension of fragments, especially, if bandage was laid without a good fixation of shoulder joint. Overdistension of scrap

with the cross break of shoulder also could lead to the formation of pseudoarthrosis of shoulder. Therefore with the application of gypsum dressing it was necessary to fix/record extremity on the discharge splint with the imposition of gypsum corset.

Rarely was encountered the formation of pseudoarthrosis as a result of the large bias of scrap along the length, as this was observed with pseudoarthroses of thigh. The muscles of shoulder are relatively weaker, especially during their damage with the bullet break, and over distend extremity, creating stretching, limited the possibility of the bias of scrap along the length.

According to the data of the central institute of traumatology and orthopedics, 8.0o/o of considerable defects of shoulder bone (into 16, 14 and 12 cm) were formed as a result of the operation/process of the radical resection of bone for the elongation/extent.

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In the clinical picture of pseudoarthrosis of shoulder was noted mainly the functional inadequacy of extremity, especially sharply pronounced during the considerable defect of bone and the available damage/defeat of nerves, during the development of the faulty

position of hand, the development of the contractures, sharply pronounced in injured people, who entered the institute through the prolonged periods after injury. Strain, pathological mobility, atrophy of muscles, sometimes the disturbance/breakdown of the mobility of adjacent joints - cubital and shoulder - were noted with pseudoarthroses, closely spaced to the joints and which were being accompanied after injury by prolonged festering.

Strain and shortening of shoulder on 5-6 cm and more were not in this case the so/such burdening moment/torque as with pseudoarthroses of lower extremity.

For pseudoarthroses of shoulder there was the characteristically frequent damage of radial nerve.

According to the data of the development of the histories of disease/sickness/illness/malady, the associated damages of nerves with pseudoarthroses of shoulder were observed in 37.00/o of injured people, including damage of radial nerve - in 19.00/o.

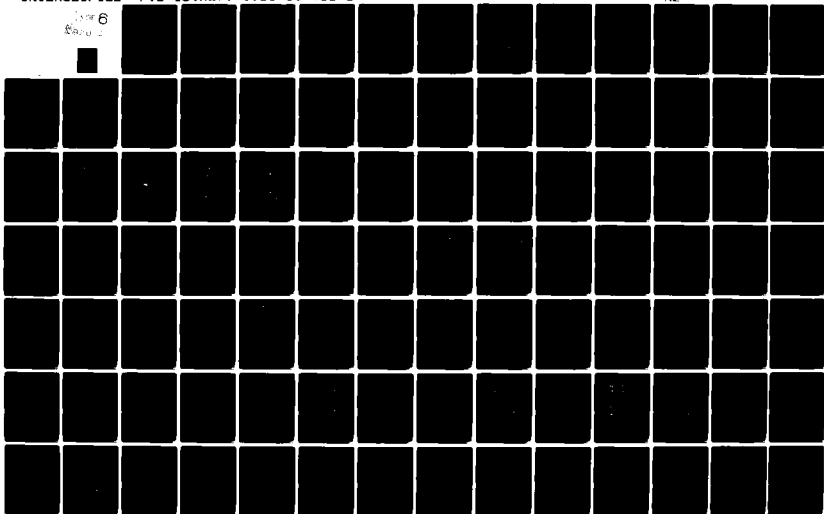
According to the data of the central state traumatological institute of the name of R. R. Vreden (G. Ya. Epstein), the damage/defeat of radial nerve with pseudoarthroses of shoulder was observed in 27.50/o of injured people.

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According to the data of the central institute of traumatology and of orthopedics, damage of nerves it was observed in 54.00/o of injured people with pseudoarthrosis of shoulder, including radial nerve - in 46.00/o.

Besides compression or jamming of the nerve between the scrap or the scars, were encountered also the gaps of nerves, which were being frequently accompanied by defect of nerve for the large elongation/extent or by Rbtssov by his regeneration.

As reading to surgical intervention served the functional inadequacy of extremity.

Into the central institute of traumatology and orthopedics entered the injured people within different periods after injury, most of all in the first two years after injury (69.00/o).

In those entered through comparatively short periods after injury (6-12 months) the results of operation were more badly than in those entered late. This is explained by the more frequent complication of suppurative process.



Not always it was possible to produce osteoplastic operation/process immediately on the admission of injured people, in 55.0o/o first it was necessary to conduct preparatory conservative treatment and series/number of pretreatments.

With pseudoarthroses of shoulder the frequent damage/defeat of radial nerve necessitated the resorting to the operations/processes on it (in 7.0o/o) or to the transplantation of tendons (in 32.0o/o); furthermore, in 13.0o/o of injured people were produced sequestrectomy and in 3.0o/o - skin plastic surgery.

The damage of peripheral nerves was accompanied by the contracture of fingers/pins and radiocarpal joint. By massage, passive and by active gymnastics, labor therapy, use/application of an ozocerite, by injections of vitreous body and by other conservative methods they tried to the operation/process to return to patient the possibility at least of passive motions, to attach extremity correct functional position. With the extensive motionless scars and the formation of skin defect after their carving preliminarily was conducted the operation/process of skin plastic surgery. Pseudoarthroses of shoulder did not give such frequent readings to the operations/processes of skin plastic surgery as, for example, shin.

The transplantations of tendons some authors (G. Ya. Epstein) made after will occur the reduction of bone. In the central institute of traumatology and orthopedics for the safeguard of function of hand this operation/process was employed to the operation/process of bone plastic surgery, since the latter required prolonged fixation and the faulty position of hand within this time could still be aggravated. Through 1-1 $\frac{1}{2}$  month after this operation/process they resorted to bone plastic surgery.



Fig. 67.

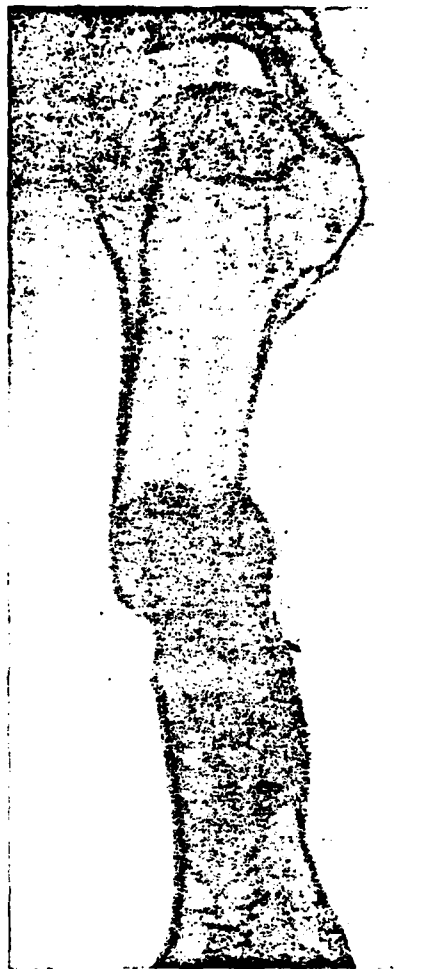


Fig. 68.

Fig. 67. K., 32 years. False joint of left shoulder. Photograph is made 5 years after injury.

Fig. 68. The same injured person. 2 Years after the operation/process of bone plastic surgery by the autotransplant, fixed/recorded by screws/propellers from the "pure/clean bone".



Fig. 69. K., 32 years. In the photograph through 3 years pseudoarthrosis of right shoulder; in the region of pseudoarthrosis the abundance of fine/small metallic foreign bodies.



Fig. 70. The same injured person. 1 Year after operation/process according to the method of intraextramedullar transplant began the reduction of the continuity of bone.



Fig. 71.

Fig. 71. K., 32 years. X-ray photograph through  $2\frac{1}{2}$  the years.  
Defect of shoulder bone.

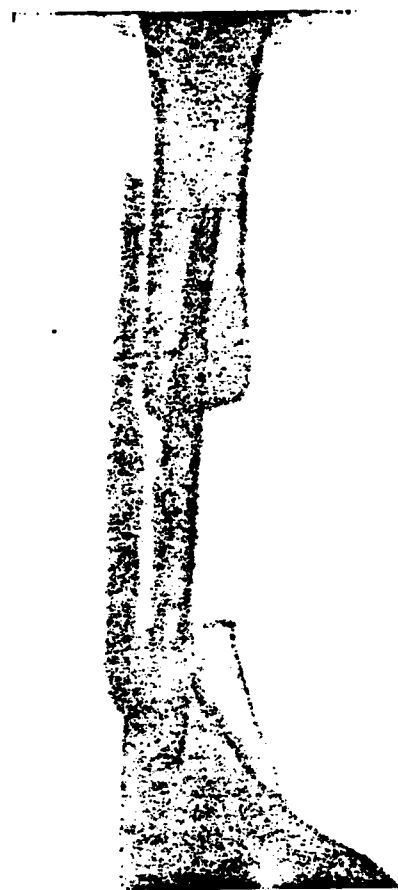


Fig. 72.

Fig. 72. The same injured person. X-ray photograph soon after  
operation/process.

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With the osteoplastic operations/processes on the shoulder is made linear section/cut over the external surface of shoulder, trying to pass dully through septum intermusculare laterale or by the anteroexternal section/cut through sulcus bicipitalis lateralis. The presence of Rubtsovs of intergrowth rarely made it possible to carry out dull dissociation of muscles.

Sometimes due to the presence Rubtsov it was necessary to produce atypical sections/cuts, taking into account the need for coating bone transplant at least with relatively normal tissues.

Osteosynthesis by catgut suture with pseudoarthroses of shoulder was applied only incidentally, with the operations/processes of sequestrectomy.

With pseudoarthrosis of shoulder is especially shown the use/application of a method of the "Russian lock", for the first time proposed by N. V. Sklifosovskiy. Obtained as a result of this operation/process shortening of extremity with the operation/process on the shoulder did not have a value.

With the formation of "lock" was conducted very reliable fixation by screws/propellers from the "pure/clean bone" or Vitallium.

During the treatment of pseudoarthrosis of shoulder just as with pseudoarthrosis of other divisions of extremities, they frequently put to use autotransplant. On the results of this method of treatment give representation following observations.

K-o, 32 years, it is injured 4/VII 1942 by the fragment of projectile into the left shoulder with the damage to the bone also of radial nerve. On DMP is produced the primary surgical processing of wound. Subsequently wound for long was festered. Injured 3 times underwent the operation/process of sequestrectomy and one time of the operation/process of osteosynthesis by catgut sutures. In 1947 in the central institute of traumatology and orthopedics is produced the operation/process of the preliminary removal/distance of metallic fragment (Fig. 67), also, through 2 weeks - bone plastic surgery by an extra-intramedullar autotransplant, undertaken from the tibia. Post-operation course is smooth. The continuity of bone was reduced (Fig. 68).

In other sick quant., 32 years, wounded in 1944, in spite of multiple metallic fragments in the region of operating wound,



afterward bone plastic surgery by autotransplant also began the reduction of the continuity of bone (Fig. 69 and 70).

In the presence of considerable defect in injured people, who were repeatedly undergoing the unsuccessful operations/processes, in which was assumed a decrease in the osteogenetic properties, the method of intraextramedullar transplant gave the best results.

For the intra-medullary pin they most frequently put to use "pure/clean bone", while for extramedullar - by autotransplant from the tibia, which was fixed/recorded with screws/propellers from the "pure/clean bone".

As an example is given the following observation.

Kir., 32 years, is injured 1/III 1944 by the explosive bullet into the right shoulder with the break of bone. Injury was complicated by osteomyelitis. 2 Months after injury is produced the resection of the ends of the scrap, while 3 months after it - repeated resection and cross-linking of radial nerve and is simultaneously applied bone plastic surgery. Operation/process was complicated by festering and repeated pseudoarthrosis. Injured person is discharged from the hospital 28/III 1945 with the healed wound.

After the admission of injured person into the central institute of traumatology and orthopedics during January 1947 is noted the absence of the reduction of the function of radial nerve and the defect of shoulder bone in middle third of shoulder after resection. In the X-ray photograph (Fig. 71) is visible the defect in 3 cm. 1/III 1947 is produced operation/process. Section/cut over the external surface of shoulder in 20 cm exposed central and peripheral scrap. Between them is thoroughly cut all over the scar tissue. In the scars it was possible to find the radial nerve which, obviously, in the place of the former cross-linking was thickened and consolidated. Nerve is isolated from Rubtsov with separate filaments. The ends of the bone scrap are refreshed to the autopsy of marrow cavity and are connected by intra-medullary transplant of the "pure/clean bone".

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Massive autotransplant is undertaken from the comb of the tibia and is fixed/recorded outside by screws/propellers from the "pure/clean bone" (Fig. 72). Are thoroughly sew soft tissues over transplantant, to the skin are superimposed catgut thin sutures. Fixation in the discharge gypsum bandage. Post-operation course is smooth. Primary adhesion. Through 1 $\frac{1}{2}$  the years began the full/total/complete reduction of bone (Fig. 73).

With the considerable defects of bone in upper third of shoulder when from central break remained one osteoporotic head, for the intra-medullary pin more preferable it was take autotransplant. During the introduction of autotransplant to porous stroma around the transplant was noted the rarefaction/evacuation of bone, but finally the transplant got accustomed to in this region even more rapid than when it was introduced into the marrow canal (injured F., Fig. 74, 75 and 76).

X., 32 years, it is injured during April 1945 by the fragment of mine into upper third of right shoulder with the break of bone. During the same day to injured person is produced the primary surgical processing of wound. After 5 days the resection of shoulder bone in upper third for the elongation/extent of diaphysis. Wounds were closed during December 1945, and during March 1946 again was opened/discovered fistula.

Injured person entered into the central institute of traumatology and orthopedics during September 1947 apropos of the loss of the function of right upper extremity as a result of the defect of right shoulder bone. After the admission is noted the presence Rubtsov and defect of bone in 12 cm (Fig. 77).

1/III 1948 is produced osteoplastic operation/process. Are refreshed the ends of the bone scrap, is thoroughly cut all over scar tissue. From the comb of the tibia are undertaken two transplants: one subperiosteal by the diameter, which corresponds to the diameter of the marrow canal of peripheral break; the second, more massive, is undertaken together with the periosteum. The first transplant connected the remaining head of shoulder bone, into which it was inserted, with the marrow canal of peripheral break. Another transplant was packed in the form of external splint and fastened with screws/propellers from the "pure/clean bone". Muscles are thoroughly cross-linked above the transplants. To the skin are superimposed, the sutures from the thin catgut. Into the region of wound it is introduced to 100000 ME of penicillin. Post-operation course is smooth. Primary adhesion. In the post-operation period it was applied penicillinotherapy. Began the full/total/complete reduction of bone (Fig. 78).

A massive superposed autotransplant, well fixed by screws of "pure bone" also gave good results.

K., 23 years, it is injured 27/III 1945 by the explosive bullet into the left shoulder with the damage to bone in middle third. On DMP is produced the primary surgical processing of wound. In EG the resection of shoulder bone. Wound was closed 3/VIII 1945. The reductions of bone did not begin. During August 1945 went away the

sequestration and fistula rapidly it was closed.

After the admission of injured person into the central institute of traumatology and orthopedics during August 1946 on the posterior and front face of shoulder are discovered the scars by the size/dimension 18x3 cm, in upper and middle third of shoulder bone defect by size/dimension into 12 cm, paralyses of radial nerve. 10/VIII 1946 to the operation/process of transplanting of bone plate was preliminarily produced the transplantation of the tendons of flexors to the extensors.

Post-operation course is smooth. K. is discharged from the reduced by function hand and the taumb (removal/diversion). In view of the departure/separation of sequestration during August 1946 to it was proposed to be for the operation/process of transplanting of bone plate not earlier than 6 months after the healing of wound.

3/III 1947 K. it entered for a second time (Fig. 79). In 2 days to the operation/process is carried out the course of penicillinotherapy. 26/III 1947 under pentothalic anesthesia/narcosis is produced operation/process. Section/cut of skin along the face from the upper to lower third of shoulder. Extremital and proximal scrap subperiosteal are isolated from the dense ones Rubtsov, is around cut all over scar tissue. The ends of the scrap are refreshed

by lateral resection to the autopsy of marrow canal. From the tibia is undertaken massive transplant together with the periosteum and the endosteum with a length of 18 cm. The ends of the transplant are strongly/firmly fixed/recorded in the prepared bed on the ends of bone scrap four by screws/propellers of the "pure/clean bone" (Fig. 80). Soft tissues are thoroughly cross-linked with catgut sutures in layers above the transplant. Is superimposed the discharge gypsum bandage with the gypsum corset. In the post-operation period it was applied penicillinotherapy. Healing is smooth. Occurred the full/total/complete reduction of the continuity of bone and function of extremity (Fig. 81).

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A good fixation was realized by another method, described below.

I., 33 years, it is injured 26/X 1942 by the explosive bullet into the right shoulder with the break of bone. Hand is immediately hanging. Injury was complicated by osteomyelitis. During December 1942 the fistulas were closed. 6/V 1943 in the evacuation hospital is produced the operation/process of bone plastic surgery with the aid of the autotransplant, undertaken from the tibia. Operation/process was complicated by festering. 3 Months after operation/process the transplant is removed. During January 1944 in one of the hospitals to

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injured person is produced the secondary operation/process of bone plastic surgery by transplant from the fibular bone.

Operation/process was again complicated by festering, in 4 months the transplant was removed.

During November 1946 I. it entered into the central institute of traumatology and orthopedics with defect of shoulder bone in 10 cm (Fig. 82) and by paralysis of radial nerve.

During November 1946 is produced the operation/process of the transplantation of tendons and through 1 1/2 month I. it is discharged from the reduced by function hand and with the possibility of the removal/diversion of large finger.

During March 1947 I. it entered again. 12/III is produced osteoplastic operation/process apropos of the defect of right shoulder bone. Exposed the place of defect are freed from Rubtsov proximal and extremital scrap. Extremital scrap is refreshed by lateral resection, is formed area/site for the future transplant. Between the scrap is cut all over the scar tissue. From the comb of the tibia is undertaken the massive transplant with a length of 18 cm. The proximal end of the transplant is introduced into the head of shoulder bone. extremital end by two screws/propellers from the "pure/clean bone" is fixed/recorded to the area/site, formed on

extremital break. Above the transplant are cross-linked soft tissues. To the skin are superimposed the sutures.

Discharge gypsum bandage with the corset. Penicillinotherapy. Post-operation course is smooth. Primary adhesion. Fixation in the gypsum bandage in the course of 8 months with the subsequent designation/purpose of a busbar-core apparatus. Began the reduction of bone (Fig. 83, 84).

Operations/processes apropos of pseudoarthroses in lower third of shoulder, are nearer for metaphysis, which, in the opinion of some authors (V. D. Chaklin), gave most unfavorable results, in the central institute of traumatology and orthopedics passed successfully.

It is necessary to note that after the coalescence of the breaks in this region in all injured people was noted either the full/total/complete disturbance/breakdown of the mobility of elbow joint or its considerable limitation, independent of the method of surgical intervention.

With the operation/process apropos of pseudoarthrosis in lower third of shoulder is necessary special care, in order not to injure the radial nerve which can prove to be that stopped up in the dense



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scars.

The nearest issues of operations/processes apropos of pseudoarthrosis of the shoulder of bullet origin, based on materials of the central institute of traumatology and orthopedics, are given in Table 259.

Table 259. Direct issues of operations/processes apropos of pseudoarthrosis after the bullet break of shoulder (in the percentages) .

(1) Операции и их удельный вес	(2) Исход	(3) Сраста- ние	(4) Срастания не на- ступило	(5) Исход не- известен	(6) Итого
(7) Остеосинтез (35,3%) . . . . .		79,1	12,6	8,3	100,0
(8) Пластика трансплантатом (64,2%)		74,4	18,6	7,0	100,0
(9) В среднем . . .		76,2	16,4	7,4	100,0

Key: (1). Operations/processes and their specific gravity/weight. (2). Issue. (3). Coalescence. (4). Coalescences did not begin. (5). Issue is unknown. (6). Altogether. (7). Osteosynthesis. (8). Plastic by transplant. (9). On the average.

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As can be seen from table 259, in one of the most important Soviet institutes, which carry out by restorative surgery, osteosynthesis was applied in more than one third of injured people with pseudoarthrosis of shoulder and gave the best results in comparison with the operation/process plastics by transplant. This is completely understandable, because osteosynthesis could be applied with the simpler forms of pseudoarthrosis, without the defect of bone.

With an increase in the period, which passed from the time of injury, the number of festerings was gradually decreased; for the years 1946-1947 to 35 operations/processes was observed altogether only one festering.

The festering, especially considerable, was one of the main reasons for nonaccretion of break after the operation/process of bone plastic surgery. However, it is necessary to note that, if festering was too not abundant, it was not necessary immediately to move away transplant and if fixation was continued, could begin the coalescence of bone.

From the complications, which were being observed in the post-operation period, it is necessary to note paralysis and the paresis of radial nerve, which in the central instituta of traumatology and orthopedics occurred in 4.40/o of those operated. After prolonged treatment subsequently in all began the full/total/complete reduction of nerve.

Surgeons must especially carefully relate to the nerve. during the separation of wound by hooks it is necessary to see to it that nerve would not be squeezed; one ought not to take nerve to the

holder. In the absence of the damage of nerve to the operation/process the surgeon not for the minute must forget about it during the operation/process.

The break of transplant after adherence occurred in 3.0o/o of those operated (central institute of traumatology and orthopedics).

To a number of complications in the post-operation period related the adherence of transplant in the proximal part and the absence of coalescence in the extremal. With such complications the boring according to Beck or osteosynthesis between the begotten transplant and the the extremal break led to the coalescence of break.

#### PSEUDOARTHROSES AND DEFECTS OF THE BONES OF FOREARM.

Nonaccreration most frequently was observed with break of both bones of forearm (5.7o/o), less frequent - with the break of ulna (4.3o/o) and most rarely - radial (3.5o/o).

This frequency is explained exclusively by the severity of the trauma whose degree completely can characterize a number of crushed breaks on each bone: with break of both bones the crushed breaks composed 34.2o/o, cubital - 11.1o/o, radial - 9.6o/o (vol. 15, pg. 276).

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Table 260. Distribution of injured people with pseudoarthrosis of the bones of forearm after bullet break according to the form/species of the damaged bone (in the percentages).

(1) Данные	(2) Название кости			(6) Всего
	(3) лучевая	(4) локтевая	(5) обе кости	
(7) Центрального института травматологии и ортопедии . . . .	40,0	20,0	40,0	100,0
(8) Центрального государственного травматологического института имени Р. Р. Вредена . . . . .	44,0	30,0	26,0	100,0
(9) Разработки историй болезни . .	34,9	40,3	24,8	100,0

Key: (1). given. (2). Name of bone. (3). radial. (4). cubital. (5). both bones. (6). In all. (7). Central institute of traumatology and orthopedics. (8). Central state traumatological institute im. R. R. Vreden. (9). Developments of histories of disease/sickness/illness/malady.

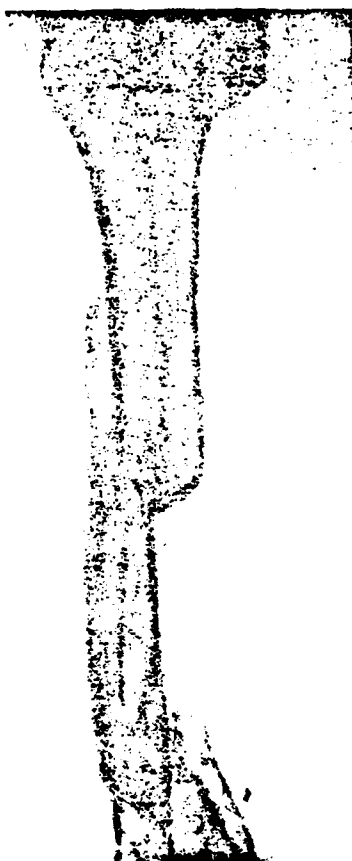


Fig. 73. The same injured person. 1 $\frac{1}{2}$  the years after operation/process according to the method of intraextramedullar transplant. Reduction of the continuity of bone.

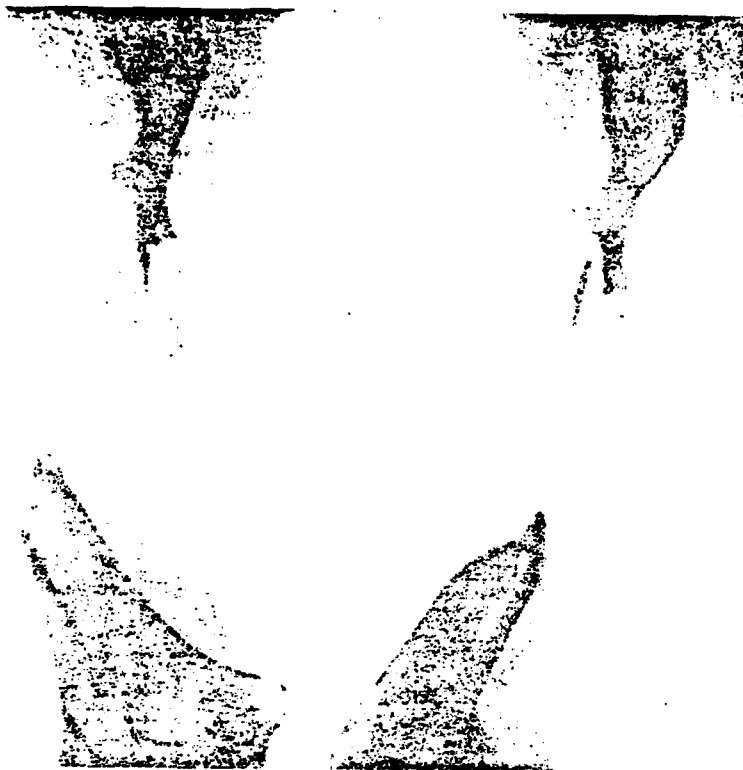


Fig. 74. P. Rentgenogram the right shoulder 27/XI 1948, the defect of shoulder bone, to the operation/process.

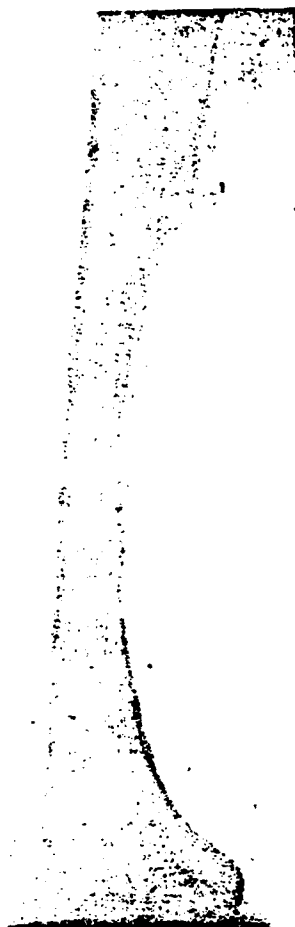


Fig. 75.

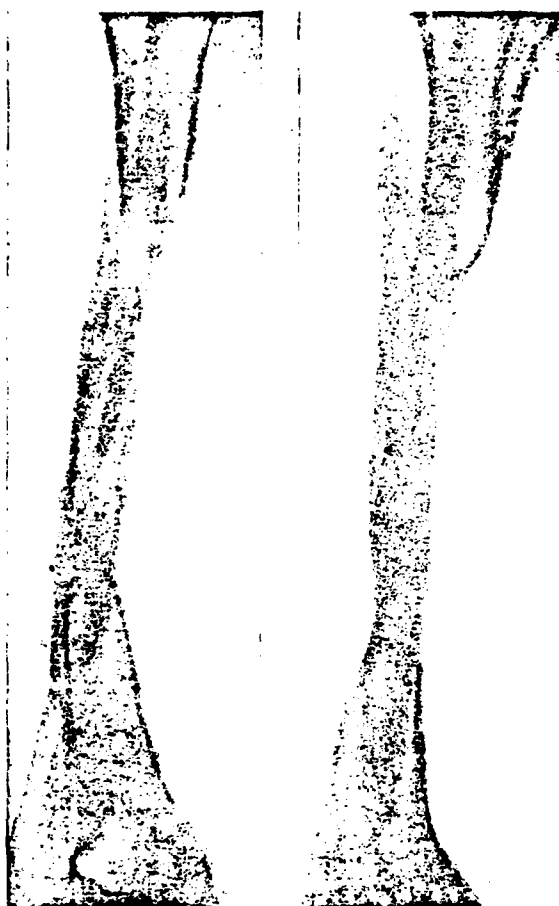


Fig. 76.

Fig. 75. The same injured person. 3 Months after operation/process according to the method of intraextramedullar transplant.

Fig. 76. The same injured person. After operation/process. Full/total/complete reduction of the continuity of bone.





Fig. 77. X., 32 years. After injury. In the X-ray photograph the defect of the right shoulder bone with a length of 12 cm immediately lower than head.



Fig. 78. The same injured person. Reduction of the continuity of bone after operation/process according to the method of intraextramedullar transplant. X-ray photograph is taken/removed 13 months after operation/process.



Fig. 79. K., 23 years. Breaking up of left shoulder. In the X-ray photograph 2 years after injury the defect of shoulder bone.

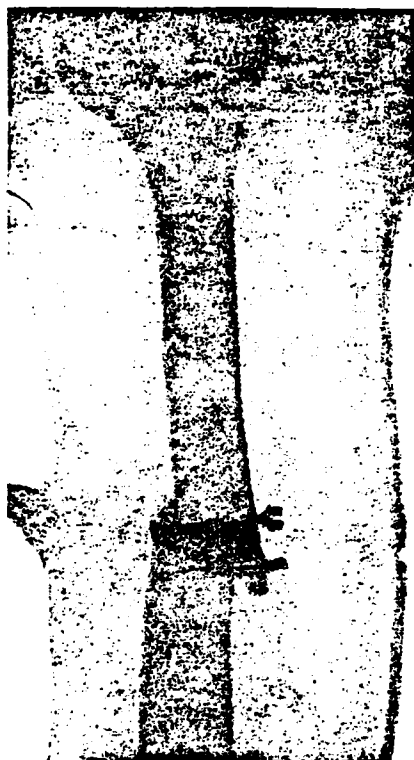


Fig. 80. The same injured person. Soon after the operation/process of bone plastic surgery by the massive autotransplant, fixed/recorded by screws/propellers from the "pure/clean bone".

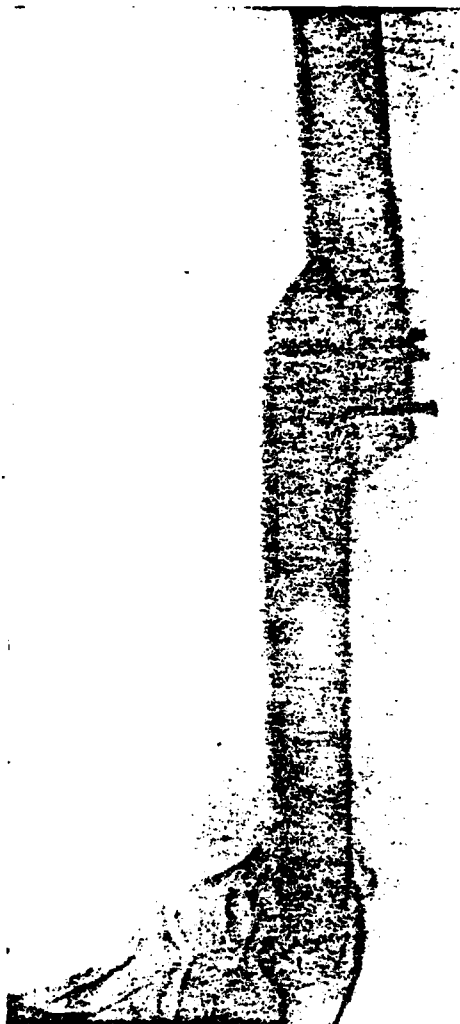


Fig. 81. The same injured person. Reduction of the continuity of bone. X-ray photograph through 1 $\frac{3}{4}$  month after operation/process.

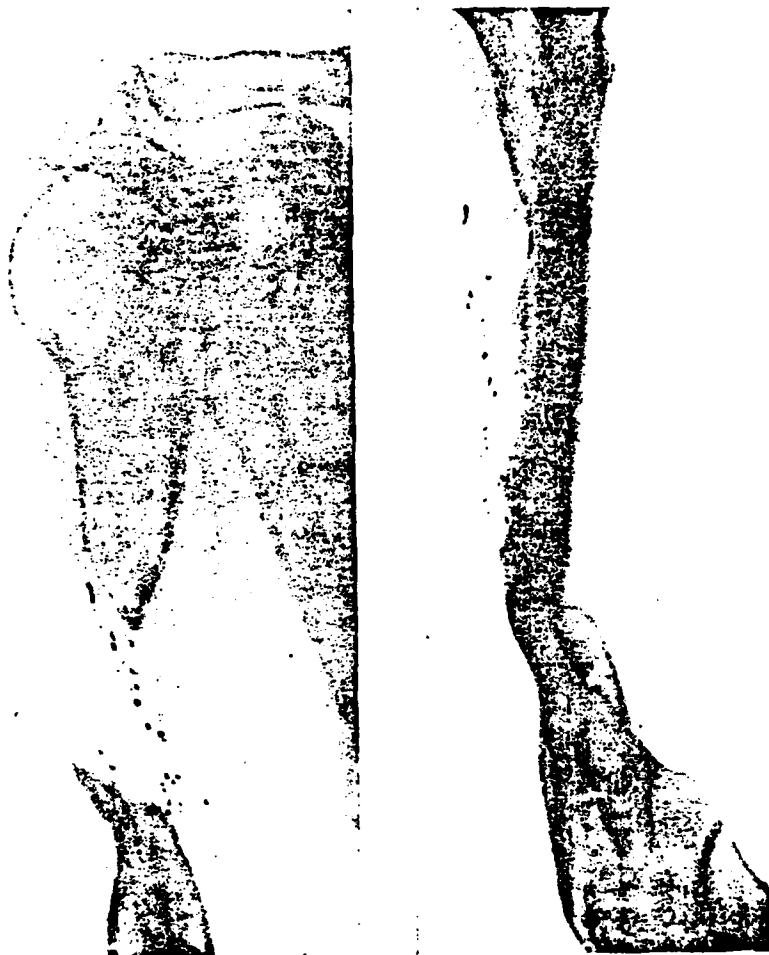


Fig. 82.

Fig. 83.

Fig. 82. I., 33 years. Defect of the shoulder bone 4 years after injury.

Fig. 83. The same injured person after operation/process of bone

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plastic surgery by massive autotransplant. The proximal end of the transplant is introduced into the head of shoulder bone. Extremital end is fixed/recorded by two screws/propellers from the "pure/clean bone" to the area/site, formed on peripheral break. X-ray photograph 4 months after operation/process.

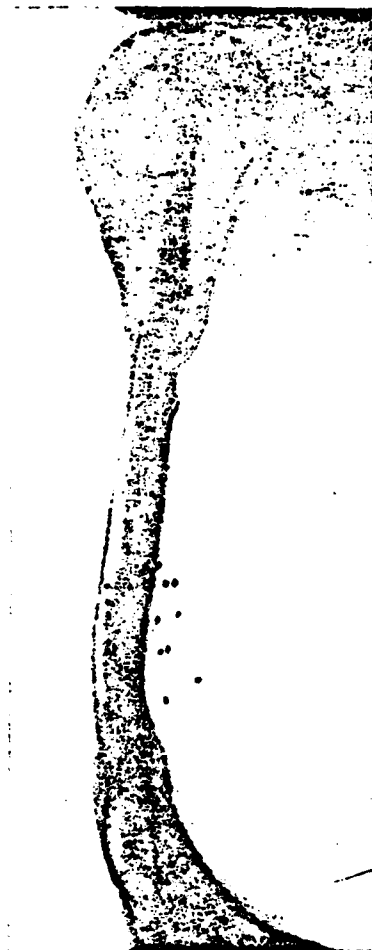


Fig. 84. The same injured person. 8 Months after operation/process began the reduction of the continuity of bone.



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The distribution of injured people with pseudoarthrosis of the separate bones of forearm, according to different data, was dissimilar (table 260).

As can be seen from table 260, based on materials of the therapeutic institutions, which carry out by the restorative surgery, the specific gravity/weight of pseudoarthroses of the ulna was less than radial one. This is explained by the fact that pseudoarthroses of the ulna more rarely underwent surgical treatment, although then there was most of all, as is evident from the data of the development of the histories of disease/sickness/illness/malady.

The frequency of pseudoarthroses of forearm is explained by the difficulty of the treatment of the breaks of this localization. The reposition of the breaks of forearm is difficult. Especially frequently were encountered the breaks of radial bone with the dislocation of the head of cubital and the breaks of the ulna with the dislocation of the head of radial.

Pseudoarthroses, which were being obtained as a result of break and dislocation, were formed as a result of the fact that the

dislocation frequently was examined/scanned and damaged was treated as simple break. It is always necessary to remember about the fact that if there is a break with the bias of scrap of one of the bones of forearm or their bending at angle and there is no break of another bone, it is necessary to search for dislocation in one of radioulnar articulation.

In some injured people was not diagnosed the dislocation of the head of ray/beam; in others - was not achieved the reposition and fixation in the gypsum bandage was not sufficient reliable.

The breaks of the ulna in lower third, even in spite of the good anatomical standing of scrap, sometimes they were not coalesced as a result of the anatomical-physiological peculiarities of the region.

In lower third the ulna has the high density of cortical layer, it is surrounded by some tendons, which creates the unfavorable conditions of its blood supply from the surrounding tissues. Therefore with the break of the ulna in lower third was disturbed the blood supply of peripheral break. All this led to nonaccretion of break at this level of the ulna.

Pseudoarthrosis of radial bone, from a functional point of view, the heavier, than nearer it is arranged/located to the radiocarpal

joint. With isolated/insulated pseudoarthrosis in upper third of one radial bone functional disorders are insignificant.

Pseudoarthroses on the boundary of middle and lower third, and in lower third of ray/bone frequently were also accompanied by the dislocation of the head of the ulna with the deviation of hand to radial side (71.60/o). This radial talipomanus was obtained as a result of the defect of radial bone and its shortening. Styloid process of ray/bone heaved above the level of styloid process of the ulna. Furthermore, upper end of extremal break of ray/bone approached the ulna sometimes close. In such injured people under the effect of the thrust/rod of square pronator the hand accepted the position of pronation.

Roentgenologically was determined osteoporosis of extremal break, sometimes in the sharply pronounced form.

With pseudoarthroses in middle third of ray/bone the strain was less sharply pronounced. Was noted the decrease of space in region lig. interosseum and the rotation of hand.

Pseudoarthroses of the ulna, according to the data of the central institute of traumatology and orthopedics, composed 20.00/o of all pseudoarthroses of forearm; they were encountered most

frequently in upper third.

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In contrast to the localization of pseudoarthroses of radial bone the severity of damage/defeat was here greater, the higher was located the place of pseudoarthrosis. Low arranged/located pseudoarthroses of the ulna caused insignificant decrease in the function and did not always require surgical intervention. In 42.00/o pseudoarthroses of the ulna they were formed as a result of the break of the ulna with the associated dislocation of the head of radial bone. They were accompanied by the expressed disturbance/breakdown of the function of extremity as a result of nonaccretion of the ulna and dislocation of the head of radial bone.

Pseudoarthroses of both bones (institute of traumatology and orthopedics) composed 40.00/o of all pseudoarthroses of forearms. Pseudoarthroses of both bones were accompanied by larger strain and loss of function, than pseudoarthroses of one bone. Both bones were usually they were affected on the same level. Were observed the most varied positions of scrap, for example, when two upper breaks were soldered with each other or fragments are sharply displaced in different positions. In a few injured people the level of the formation of pseudoarthrosis of radial and ulna was found at

different height. In some one of the bones retained its normal length, and in another there was a larger or smaller loss of bone substance.

The treatment of pseudoarthroses of the forearm of bullet origin presents special difficulties to the form/species of the poor conditions of the blood supply of the bones of forearm, especially in lower third, where around the bones predominantly are located tendons.

A deficiency/lack in the soft tissues with the operations/processes of free bone transplantation impedes coating the grafted/transplanted free transplant.

To a number of unfavorable moments/torques in the treatment of pseudoarthrosis of forearm relates the frequent damage of peripheral nerves.

According to the data of the development of the histories of disease/sickness/illness/malady, simultaneously with pseudoarthrosis of forearm into 33.0o/o were noted the damages of the nerves from which 26.5o/o fall in the fraction/portion of cubital, 16.8o/o - radial, 6.2o/o - middle, 45.1o/o - in the fraction/portion of several nerves; into 5.4o/o it is not established/installed, what nerve is

damaged.

According to the data of central institute traumatologies and orthopedics, damage of nerves were noted in 50.00/o of injured people. In this case were distributed they as follows: radial nerve - 40.00/o, middle - 17.00/o, cubital - 10.00/o, several nerves - 33.00/o. With the break of the bones of forearm the reason for the formation of pseudoarthrosis was frequently interposition of soft tissues.

The damage of nerves on the forearm was more severe complication than on the shoulder on which surgical intervention on the nerve gave the best results, rather than on the forearm. When the cross-linking of nerve on the shoulder it was impossible due to its large defect, reducing operations/processes on the tendons of forearm gave the results, which completely satisfy injured person and surgeon.

In the majority of injured people the operation/process on the nerves of forearm due to the large decomposition of soft tissues or remoteness of injury was not shown or was unsuccessful. When operation/process on the nerve was possible, it they produced earlier than bone plastic surgery, and then, on the average in a month, is made the operation/process on the bone.

With pseudoarthroses of forearm, in spite of the severity of the damage of nerves, frequently began the reduction of the integrity of bone after osteoplastic operations/processes, moreover frequently within the usual periods.

That presented can be illustrated by the following observations.

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I., 29 years, it is injured 26/XII 1942 into the right forearm with the break of radial bone. Through 2 years of 3 months after injury it entered into the central institute of traumatology and orthopedics apropos of the not-grown-together break of right radial bone; after the admission was noted the expressed atrophy of the muscles of right forearm and the hands, scar on the rear of forearm, soldered with the subject tissues, paralysis of middle nerve. In the X-ray photograph are determined the defect of radial bone in lower third, the dislocation of the head of the ulna.

29/III 1945 the operation/process: is found the central and peripheral cut of middle nerve. The defect between them is filled with the conserved treated with formalin homograft of middle nerve. Post-operation course is smooth. Primary adhesion.

In a month the second operation/process: by section/cut on the dorso-ulnar edge in lower third of forearm is exposed and resected for the elongation/extent 5 cm the head of the ulna. The second section/cut on the dorsoradial edge exposed the place of pseudoarthrosis. Subperiosteal are isolated ends and they are connected with the aid of the piece of the resected ulna. Post-operation course is smooth.

With the inspection of injured person through 3 years is discovered the reduction of the continuity of bone in the place of former pseudoarthrosis and the contracture of fingers as a result of paralysis of middle nerve.

G., 31 year, is injured 9/X 1942 by the fragment of mine into the left forearm with break of both bones. After the admission into the central institute of traumatology and orthopedics 10/IX 1943 in injured person in middle third of forearm is noted sharp strain and pathological mobility of both bones (Fig. 85). On the back and lateral surface - extensive scars, soldered with the subject tissues. Atrophy of the muscles of forearm. During the neurologic investigation it is discovered par of middle and radial nerve.

18/IX 1943 is produced osteosynthesis of both bones. Two sections/cuts along the dorsoradial and dorso-ulnar side exposed the



place of pseudoarthrosis, the ends of the fragments of radial and ulna are processed according to the type of "Russian lock" and are connected by catgut. Prolonged (in the course of 9 months) fixation in the gypsum bandage. Subsequently began the consolidation of break. With the inspection through  $4\frac{1}{2}$  the years is discovered the coalescence of break (Fig. 86).

Hand is cyanotic, are absent the active motions of fingers/pins as a result of paralysis of middle and radial nerve.

In injured G., in spite of the severity of the damage of nerves, began the full/total/complete reduction of the continuity of bone, but the function of hand, just as in injured I., was disrupted.

Was raised the question, it is worth such injured people subjecting to complex osteoplastic operations/processes, without giving to them guarantee in the reduction of function. This question was solved positively, since during the reduction of bone nevertheless appeared the possibility of some, although bounded function due to the muscles, innervated by the undamaged/uninjured nerves. Furthermore, the function of extremity could be partly restored/reduced via the transplantation of tendons. This operation/process was conducted with paralysis of radial nerve. In one injured with paralysis of the middle nerve of plastic tendon it

was successfully produced by the transplantation of the extensors of hand to the flexors. During the reduction of the continuity of bone the injured person could restrictedly put to use extremity with the work of healthy/sound hand.

In the presence of considerable ones Rubtsov was preliminarily conducted skin plastic surgery by graft/flap on the pedicle from the skin of stomach and in 1-2 months the operation/process of bone plastic surgery.

In the Gor'kiy institute of orthopedics and restorative surgery in such injured people was simultaneously employed the operation/process of skin and bone plastic surgery by autotransplant on the wide musculo-cutaneous pedicle (pg. 383).

For warning/preventing the compression as a result of edema of extremity in the post-operation period with the application of gypsum dressing it was necessary to place wadded packing in the region of cubital bend and radiocarpal joint or after the application of gypsum dressing to immediately cut it along the length and to attach extremity the elevated position not less than into 48 hours (usually on 3-4 days). However, from the first days after operation/process was assigned the active gymnastics of fingers/pins on 3-5 minutes each hour.

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For the access to the radial bone the section/cut was done on the back surface in the direction from external condyle of shoulder to styloid process of radial bone.

In upper third radial bone was uncovered carefully in order not to injure posterior interosseal nerve.

In upper and middle third radial bone was uncovered between the common extensor of fingers and the radial extensor of hand; in lower third - between the short and long extensor of the thumb.

To avoid damage with the operations/processes it is necessary to remember that to four cross fingers/pins proximally from styloid process of ray/beam emerges ramus superficialis nervi radialis.

Is most difficult for the access the upper cut of radial bone. Here could be encountered a deep branch of radial nerve and a. recurrens radialis posterior. It was necessary to separate the

partition/septum between long and short radial extensor of hand, thanks to which it became well visible m. supinator brevis and the passing here deep branch of radial nerve which should have been moved aside towards the inside; m. supinator brevis it was moved aside subperiosteally, after which radial bone proved to be available.

The exposure of the ulna was conducted by size/dimension along its comb.

With the single-stage operation/process of pseudoarthrosis of both bones it is necessary to go by two sections/cuts: on posterior-external side for the exposure of radial bone and posterior-internal edge - ulna.

Depending on the method of surgical intervention was conducted the refreshment of bone scrap. With the small remoteness of pseudoarthroses with a good standing of scrap marrow cavity was revealed by drill or by U-shaped chisel. During the displacement along the length the refreshment was conducted over the lateral adjacent to each other surfaces of scrap by ledged resection according to the type of "Russian lock".

With pseudoarthroses of large remoteness, which are accompanied by the sclerosis of bone ends, was required their resection before

the appearance of the normal bleeding bone tissue and autopsy of marrow cavity. After their refreshment bone scrap were given into a good contact and accurately they were fixed/recorded.

The method of operation/process depended on that, there was pseudoarthrosis of both bones of forearm or one of them, from the level of pseudoarthrosis and from that, was accompanied pseudoarthrosis of one of the bones by the dislocation of another bone.

With pseudoarthrosis of both bones of forearm arose the question, to perform the operation/process of bone plastic surgery on both bones is one-time or into two stages, for example, first on the radial bone as more important in functional sense, then after its consolidation - on the second bone. Some authors (for example, G. Ya. Epstein) recommended the performing of operation/process into two stages.

Single-stage operation/process has more than advantages, since, operating one-time, to more easily preserve correct anatomical relationship/ratio of both bones.

With single-stage operation/process of both bones better it was go by two sections/cuts. Initially was applied the cross-linking of

the ulna, and then radial, in order not to produce its displacement. The well fixed/recorded preliminarily ulna served as if splint for the radial bone.

As a rule, osteosynthesis was conducted on both bones even during the insignificant displacement of the second bone, since the noncross-linked bone could give secondary displacement.

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Fig. 85. G., 31 year. Pseudoarthrosis of both bones of the left forearm 7 months after injury.

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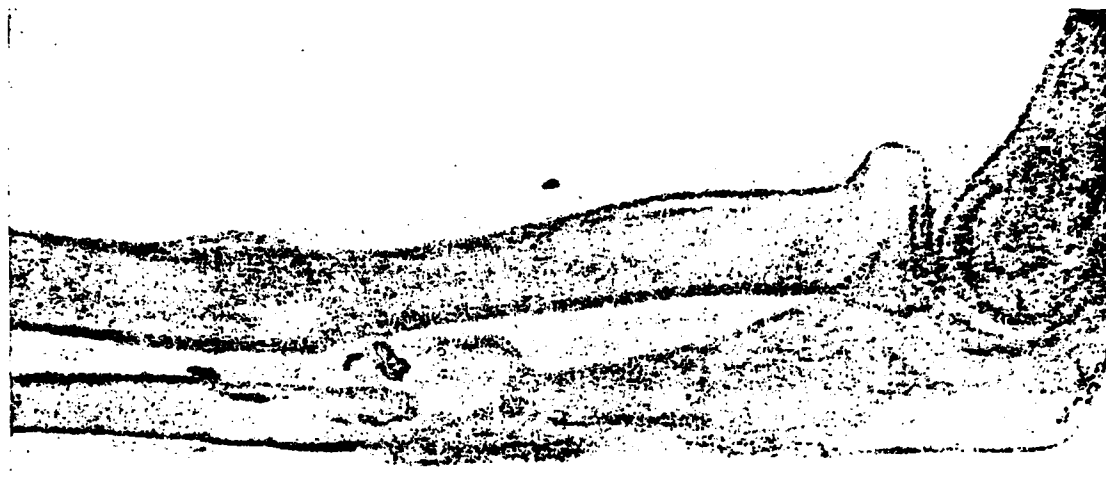


Fig. 96. The same injured person. 4 1/2 years after osteosynthesis of both bones. There is a consolidation of both bones.



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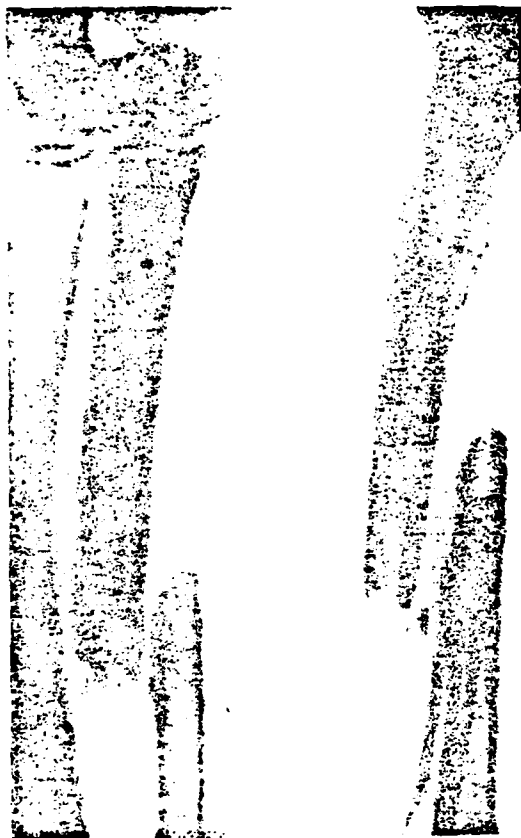


Fig. 87. F., 39 years. Pseudoarthrosis of both bones of left forearm.

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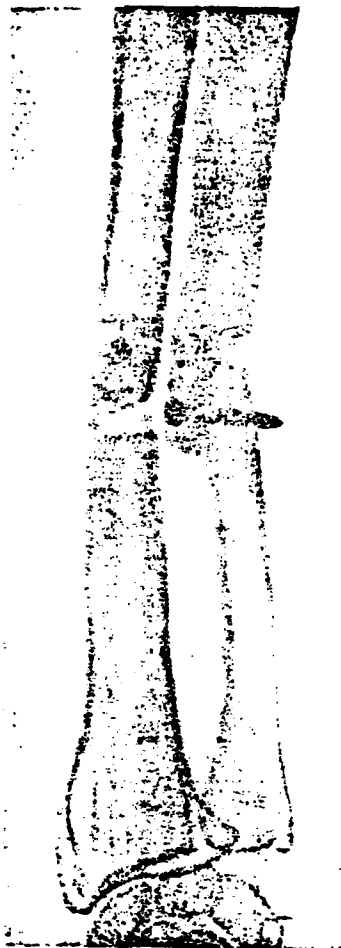


Fig. 88. The same injured person. X-ray photograph after operation/process according to the method of "Russian lock" with the fixation of radial bone by screws/propellers from the "pure/clean bone", ulna - by screw from Vitallium.

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Osteosynthesis of both bones in the absence of the defect of bone substance should have been produced with plates from the "pure/clean bone", Vitallium or plastic, connecting scrap end into the end; more frequent according to the method of "Russian lock". As the illustration is given the following observation.

P., 39 years, it entered into the Central institute of traumatology and orthopedics 17/V 1947 with not-grown-together break of both bones of left forearm, damage of ulnar nerve, limitation of the mobility of fingers/pins as a result of their contracture (Fig. 87).

1/VI 1974 is produced operation/process under pentowillow anesthesia/narcosis.

Section/cut along back-internal side exposed the not-grown-together break of the ulna. Between the scrap - interposition of soft tissues. Scrap are subperiosteally isolated, refreshed, set according to the type of "Russian lock" and are fixed/recorded by screw of Vitallium. Another section/cut in the region of radial bone exposed the place of pseudoarthrosis. Scrap are included in the dense connective capsule during dissection of which was secreted serous transparent/hyaline fluid/liquid. The bag, which determined the place of pseudoarthrosis, is cut all over. The ends of

the scrap are processed according to the type of "Russian lock" and are fixed/recorded by two screws/propellers of the "pure/clean bone". Wound is in layers sew, to the skin superimposed catgut sutures. Extremity is packed in the position, the average between the pronation and the supination. Gypsum bandage to upper third of shoulder. Post-operation course is smooth. Primary adhesion. On that bone on which the fixation is produced by screws/propellers from the "pure/clean bone", consolidation was noted after only (Fig. 88), while on another bone where the fixation was produced by screws/propellers from Vitallium, consolidation yet did not begin. With the inspection in 7 months began full/total/complete coalescence of both bones (Fig. 89).

Pseudoarthroses of both bones in lower third were accompanied by the considerable strain for correction of which was required intervention on both bones simultaneously.

In many patients with pseudoarthrosis in lower third of both bones of forearm after operation/process on both bones was observed the coalescence of radial bone and the absence of the coalescence of the ulna.

Isolated/insulated pseudoarthroses of radial bone, according to the data of the Central institute of traumatology and orthopedics,

were encountered more frequently than by cubital. 71.60/o of pseudoarthroses of ray/ream were accompanied by the dislocation of the head of the ulna. When there was a dislocation of the head of the ulna, was conducted section/cut from the dorso-ulnar edge of forearm in the region of the head of the ulna, and it was resected for the elongation/extent 3-4-5 cm. By the second section/cut on back- radial edge was uncovered the place of pseudoarthrosis of radial bone, bone fragments subperiosteally were secreted and reponated.

By important and basic point considered reliable fixation plate the screws/propellers. Fixation by catgut or by wire with these forms/species of pseudoarthroses should not be applied in view of its unreliability.

With defect of one of the bones the forearms, mainly radial, resorted to the operation/process of bone plastic surgery.

With the more considerable defects their filling was realized by an autotransplant.

N., 33 years, it is injured at the front in 1944 by the fragment of projectile into the right forearm with the damage to radial bone. Wound was closed through half a year.

After the admission into the Central institute of traumatology and orthopedics 14/V <sup>1947</sup> ~~1974~~ is noted the expressed atrophy of the muscles of right forearm. On the back surface of forearm scars by the size/dimension 6x2 cm and 4x1 cm, soldered with the subject tissues. Forearm in the position of supination. The motions of pronation are absent. In the X-ray photograph (Fig. 90) between the scrap of right radial bone was determined the defect in 4.5 cm. Dislocation of the head of the ulna.

26/V under the local anesthesia produced carving Rubtsov are superimposed sutures. Primary adhesion. 16/VI operation/process under pentowillow intravenous anesthesia/narcosis. By section/cut on the cubital edge is exposed and resected the head of the ulna.

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The second section/cut in the region of defect exposed the ends of the radial bone, they are refreshed by their resection to the autopsy of marrow canal, after which was formed the defect in 8 cm. From the comb of the tibia are undertaken (by electric saw) two transplants: one without the periosteum is introduced intra-medullary as the fixer, and another massive, it is packed in the form of applied transplant and it is fixed/recorded in the slots/grooves, made on central and peripheral break. Are additionally carried out fixation

for excess periosteum of transplant and periosteum and soft tissues of the fragments of radial bone.

Post-operation course is smooth. Primary adhesion. Began the reduction of the integrity of bone and function of extremity (Fig. 91).

With the large defects of radial bone in view of the unfavorable anatomical-physiological conditions it was possible to recommend the substitution of the defect of radial bone by the remaining undamaged/uninjured ulna, moreover for the fixation could serve wire, that it is possible to see in Fig. 92 and 93 (X-ray photograph of radial bone injured A.).

Bronze-aluminum wire - inert metal, its removal/distance it presented difficulty; therefore with these operations/processes the author applied also screws/propellers from the "pure/clean bone".

A., 32 years, it is injured in 1943 by the fragment of mine into the right forearm; the break of radial bone. It entered into the central institute of traumatology and orthopedics in 1946 with the sharply pronounced strain and the large defect of radial bone, the dislocation of the head of the ulna (Fig. 94), by the multiple scars of skin and soft tissues and by the loss of the function of

extremity. As a result of considerable Rubtsovs changes in the skin and soft tissues the operation/process of free bone transplantation would be unconditionally unsuccessful. It was necessary to resort to the operation/process of the substitution of the defect of radial bone by the undamaged/uninjured ulna whose osteotomy was conducted at the level of extremital break of radial bone. End of central break of the ulna and extremital scrap of radial are refreshed and connected according to the type of "Russian lock". Both breaks are fixed/recorded by screws/propellers of the "pure/clean bone" (Fig. 95). Post-operation course is smooth. Began the reduction of the continuity of bone (Fig. 96). Pronation and supination were accomplished due to the motions in the shoulder joint.

The disturbance/breakdown of the removal/diversion of the thumb is restored/reduced via the transplantation of the tendon of the radial flexor of hand to the tendon of extensor and the discharge muscle of the thumb.

42.00/o of pseudoarthroses of the ulna were observed in upper and middle third with the simultaneous dislocation of the head of ray/beam. For the establishment of the correctness of the relationship/ratio of scrap in such injured people it was necessary to begin operation/process from the resection of the head of radial bone, and then with the second section/cut to go in the place of



pseudoarthrosis of the ulna.

After liberation/excretion the scrap of the ulna were established in the correct relationship/ratio. Here the special importance, still greater than with the fresh breaks of radial bone with the dislocation of the head of cubital, had strong/firm fixation of scrap of the ulna, which exhibited even sharper inclination to the angular displacement to the side of radial bone as a result of the contracture of muscles. Fixation by catgut suture and even wire with this form/species of pseudoarthrosis was insufficient. Even when began the coalescence of break, after fixation by catgut was noted the strain of the ulna due to deflection of scrap to the radial side.

With not caused the disturbance/breakdown of function pseudoarthrosis of the ulna on the boundary of middle and lower third in lower third surgical intervention was not always required.

The treatment of considerable defects of one of the bones of forearm after bullet damages was the difficultly solvable problem.

The presence of pseudoarthrosis of two bones, dissimilar by their functional significance, frequently required different procedure of surgical intervention.

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The operations/processes of the transplantation of free transplant in the bed from the badly/poorly feeding scar tissue in many injured people were gloomy to the failure; even after the removal/distance of those seen Rubtsov remained the still Rubtsov changed tendons.

When there was a considerable defect of the ulna and a dislocation of the head of radial, it was possible to substitute the defect of the ulna in upper and middle third by radial bone, after connecting the latter after the resection of dislocated head with the proximal break of the ulna.

The breaks of transplant with the operations/processes on the forearm it was not observed. Sometimes was noted the resorption of transplant and favorable post-operation course.

Many surgeons (M. O. Fridland, B. K. Babich) detected the resorption of the autotransplant of afterward bone plastic surgery, especially with the defects of the bones of bullet origin. High value had not only the quality of the grafted/transplanted transplant, but also that medium, into which it was grafted/transplanted. On the frequency of the favorable outcome of operations/processes apropos of pseudoarthrosis of forearm it is possible to judge according to data

of one of the major therapeutic institutions (Table 261).

As can be seen from Table 261, the best results were obtained with pseudoarthroses of radial bone, worse - with pseudoarthroses of both bones, the mid-position occupied radial bone. With interventions apropos of pseudoarthroses of the bones 68.00/o operations/processes (on the average) ended by coalescence the bones. It is completely logical that the worse results were obtained with pseudoarthroses of both bones. Besides the technical difficulties with the operations/processes simultaneously on both bones, it is necessary to consider that in extremital third after single-stage operation/process frequently was observed the coalescence only of radial bone.

Table 261. Frequency of growing together of bone after operation/process apropos of pseudoarthrosis of the bones of forearm after the bullet break (in the percentages to a total number of those operated) .

(1) Лечебное учреждение	(2) Локализация псевдартроза	(3) Лучевая кость	(4) Локтевая кость	(5) Обе кости
(6) Центральный институт травматоло- гии и ортопедии . . . . .		69,2	71,5	64,0

Key: (1) . Therapeutic institution. (2) . Localization of pseudoarthrosis. (3) . Radial bone. (4) . Ulna. (5) . Both bones. (6) . Central institute of traumatology and orthopedics.

#### PSEUDOARTHROSES AND BONE DEFECTS OF THIGH.

The clinical picture of pseudoarthrosis of thigh was characterized by pathological mobility for the elongation/extent of diaphysis, loss of the function of extremity due to the disturbance/breakdown of its safety, by sharp atrophy of muscles, by associated contractures and ankylosis of joints, by shortening of extremity and by presence of trophic ulcers during the damage of sciatic nerve. The majority of those observing in the Central institute of traumatology and orthopedics of injured people with pseudoarthrosis of thigh had the strain of extremity due to the

displacement of scrap, the considerable contracture of muscles with forming of Rubtsovs of intergrowth.

With pseudoarthrosis of thigh the central institute of traumatology and orthopedics noted the shortening of extremity from 2 to 17 cm; most frequently - shortening from 7 to 10 cm.

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In these all injured people after primary surgical processing was laid the splint or gypsum bandage, but neither in one of them nor during the operation/process nor after it was not conducted even the cautious reposition of the displaced scrap. In 30.00/o of injured people subsequently was applied skeletal/skeleton stretching, but it was realized later than 4 months and proved to be barely effective.

Into the central institute of traumatology and orthopedics the injured people entered late periods after injury - in the overwhelming majority in 6 months. After the early admission via stretching it was possible to amend strain and to bring shortening to 1-3 cm.

E., 37 years, it is equal during October 1943 into middle third of right thigh with the break of bone, in the Central institute of

traumatology and orthopedics it arrived 6 months after injury in the gypsum bandage to fixed/recorded by strain in the form of galif and shortening of extremity on 6 cm. After the imposition of skeletal/skeleton stretching with the large load (to 11 kg.) the shortening decreased to 1 cm. After the elimination of strain and shortening was produced the operation/process of osteosynthesis.

The shortening of extremity was noted also in the absence of the defect of bone as a result of the considerable displacement of scrap. The late imposition of skeletal/skeleton stretching in such injured people could not already lead to the comparison of scrap.

K., 22 years, injured by the fragment of aerial bomb into upper third of right thigh during September 1941. It entered into the central institute of traumatology and orthopedics in a year (October of 1942) with the shortening of extremity on 14 cm due to the displacement of extremital break upwards and towards the inside. Is superimposed skeletal/skeleton stretching with the large load with the aid of which it was possible to bring shortening to 11 cm.

Especially with difficulty yielded to correction strain with pseudoarthroses of thigh in upper third. In 33.00/o of injured people the strain was caused by the defect of bone, while in remaining - by displacement of scrap.

According to the data of the central institute of traumatology and of orthopedics, damage of sciatic nerve with the disturbance/breakdown of trophic system, the formation of ulcer and faulty position of extremity in the form of horse foot it composed 30.00/o (see also pg. 373).

The treatment of pseudoarthrosis of thigh after bullet break was difficult problem in the surgery. During the solution of a question about possibility and need for surgical intervention it was necessary to consider many moments/torques.

The possibility of surgical intervention was placed the dependence both on the general state of injured person and on the local changes: degree and form of fracture of bone, shortening, state of the surrounding soft tissues, blood circulation, damage of the nerve trunks and trophic disorders of extremity.

With the defect of femoral bone of more than 10 cm even after successful operation/process the injured people had to long time put to use orthopedic apparatus in order not to subject themselves the graduation mark of the break of thigh on the spot for transplantation.

However, after successful operation/process injured people carried orthopedic apparatus usually not more than 2 years and after this they began to put to use their extremity without the prosthesis.

Observing the distant results of the afterward successfully carried out osteoplastic operations/processes, it is possible to note that by injured person it was more easily walk in the orthopedic foot-wear, than in the crthopedic apparatus.



Page 400a.

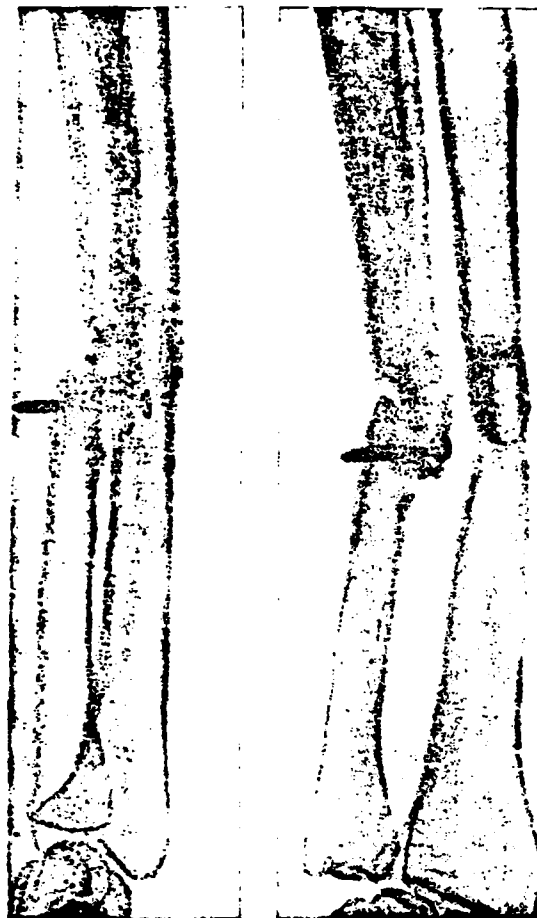


Fig. 89. The same injured person. X-ray photograph 7 months after operation/process.

Page 400b.

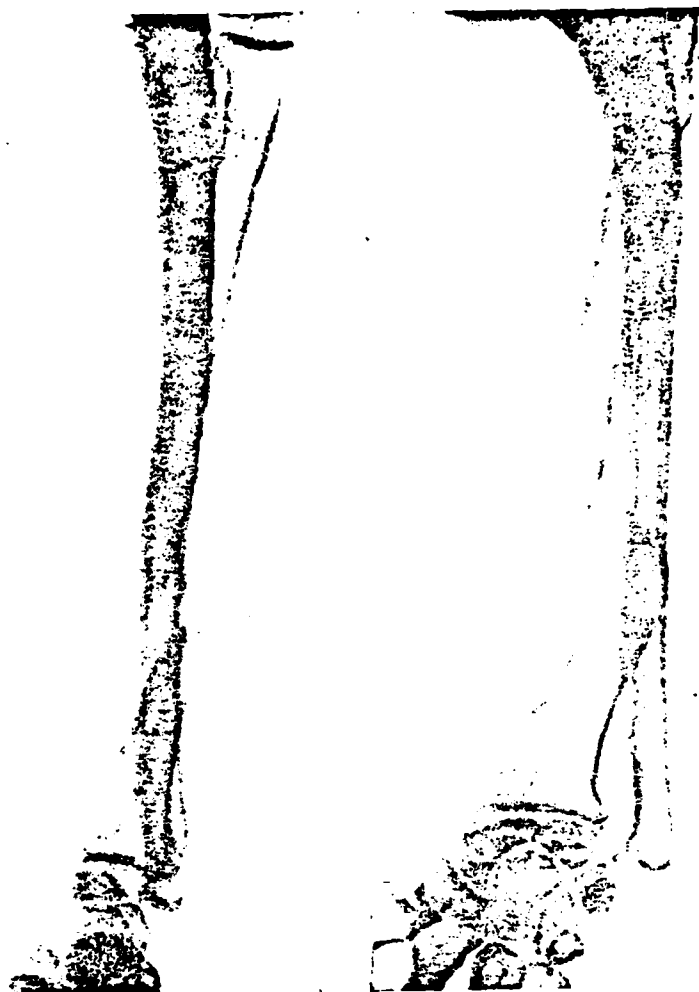


Fig. 90. N., 33 years. Photograph is made 3 years after injury.  
Defect of radial bone and dislocation of the head of cubital.

Page 400c.

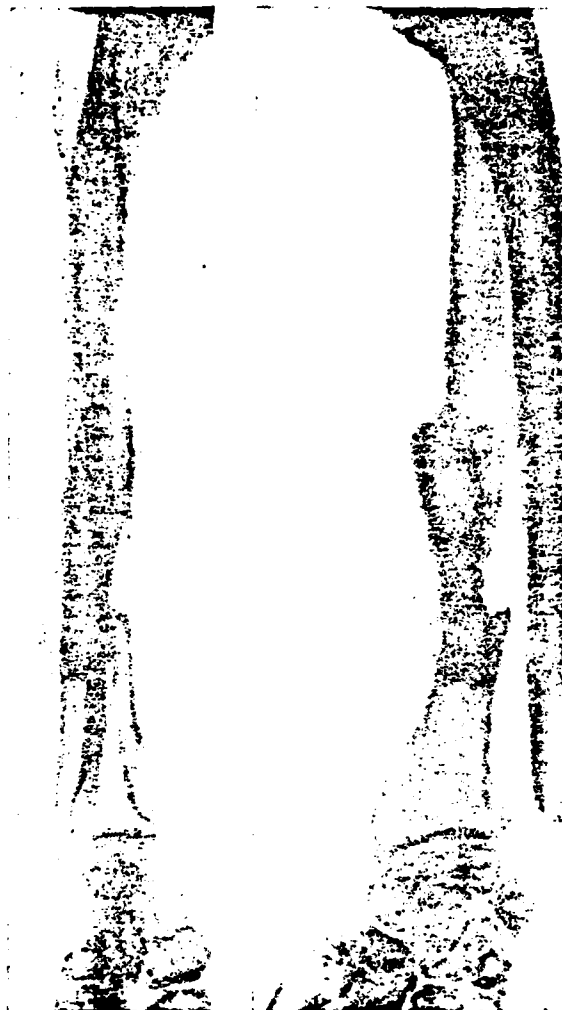


Fig. 91. The same injured person. X-ray photograph 7 months after the operation/process of the substitution of the defect of radial bone by autotransplant and the resection of the head of the ulna.

Page 400d.

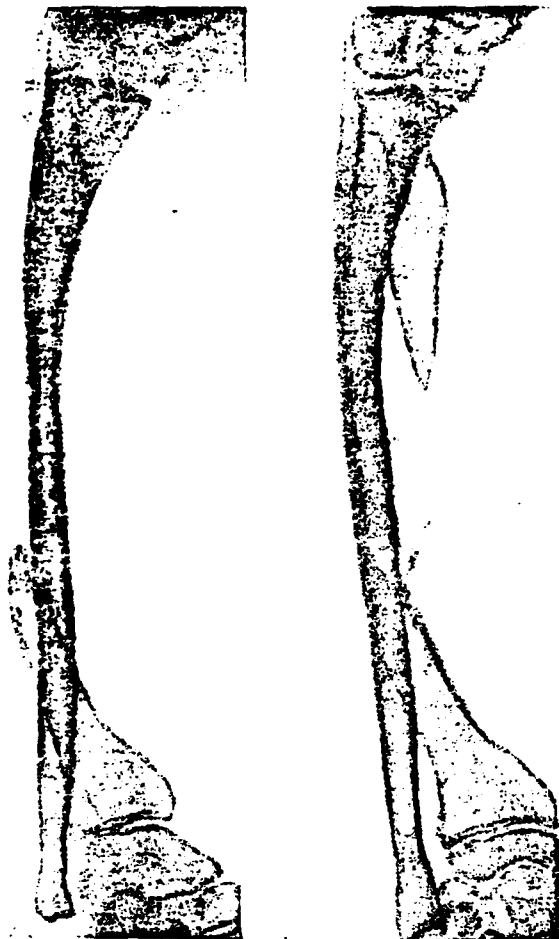


Fig. 92. A. X-ray photograph of 30/I 1947. Defect of radial bone and dislocation of the head of cubital.

Page 400e.

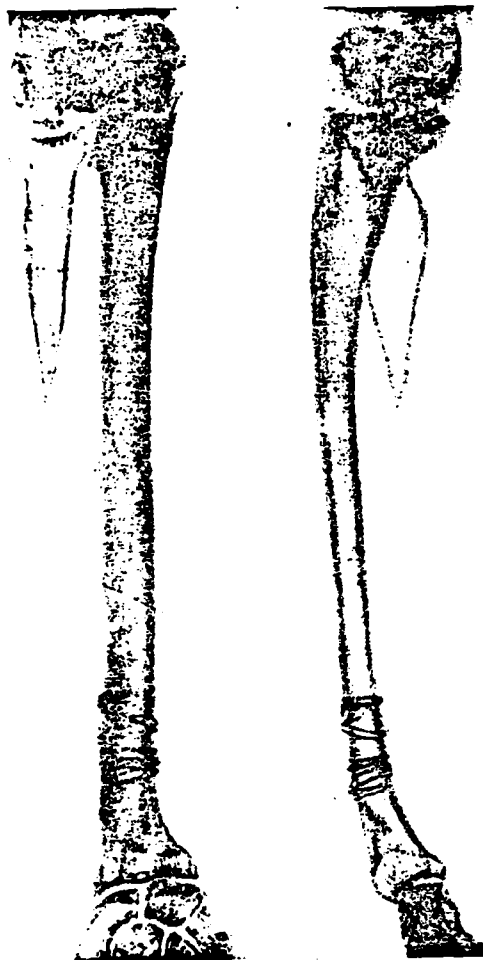


Fig. 93. The same injured person. X-ray photograph after the substitution of the defect of radial bone by cubital with the fixation wire.

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Fig. 94. A., 32 years. X-ray photograph 3 years after the injury of right forearm. Defect of radial bone and dislocation of the head of cubital.

Page 400g.

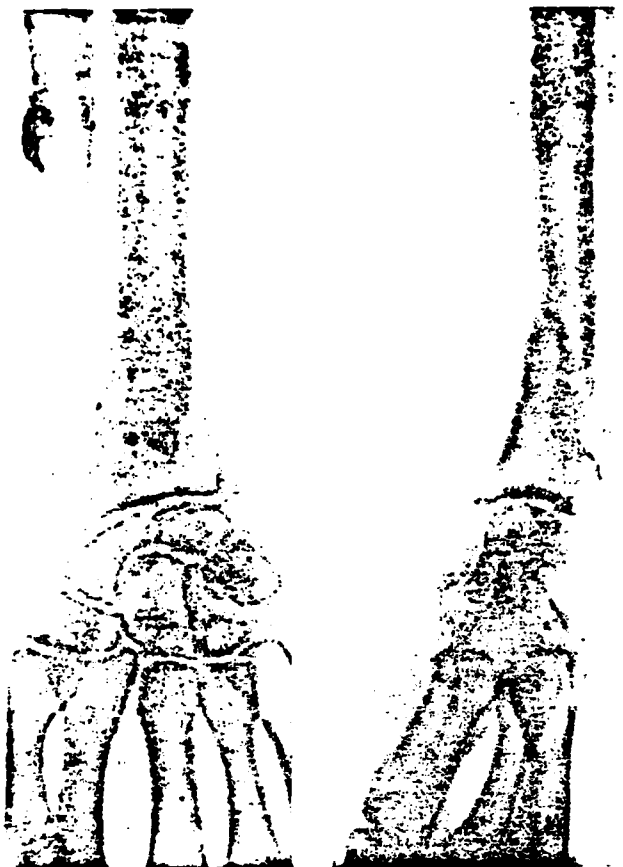


Fig. 95. The same injured person. X-ray photograph after the operation/process of the substitution of the defect of the radial bone of cubital with the fixation by screws/propellers from the "pure/clean bone".

Page 400h.

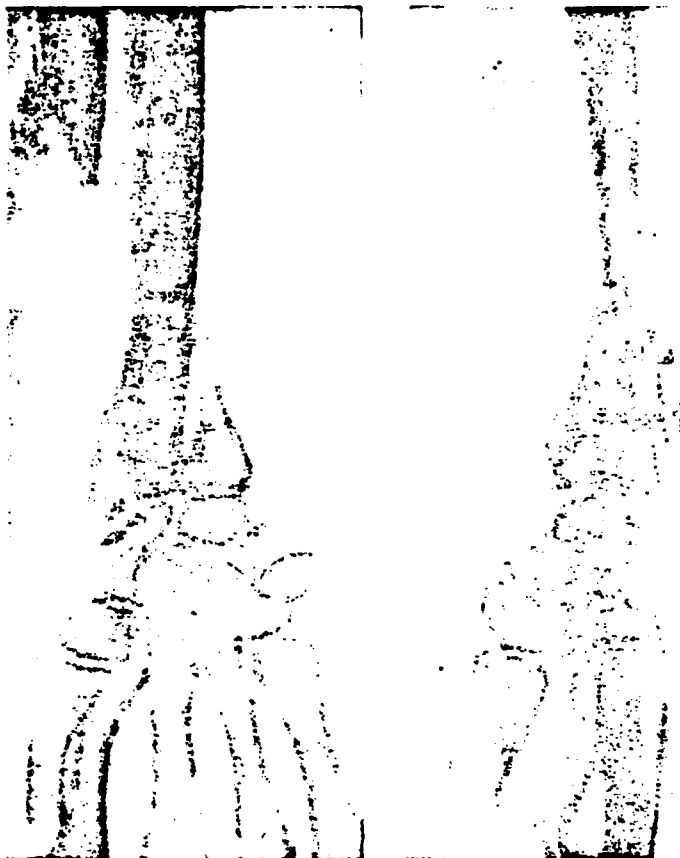


Fig. 96. The same injured person. X-ray photograph 7 months after operation/process. Evidently gradual resorption of screws/propellers from the "pure/clean bone" and coalescence of break.



Page 400i.



Fig. 97.

Fig. 97. T., 21 year. 1 Year after injury. Defect of left femoral bone.

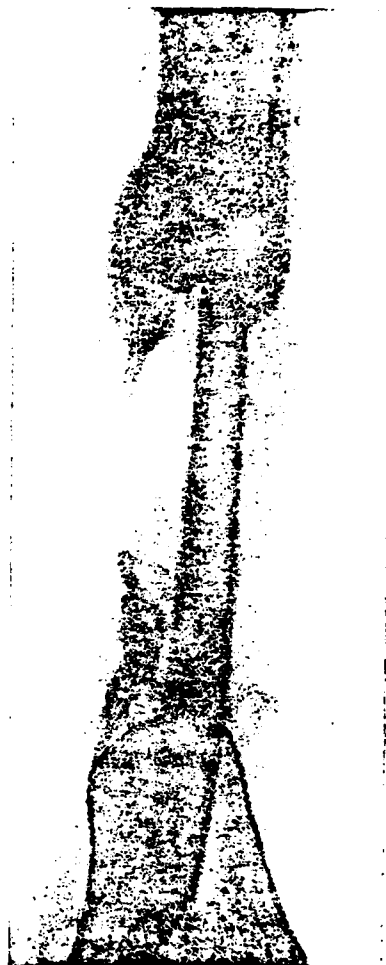


Fig. 98.

Fig. 98. The same injured person next day after operation/process.

Page 400j.



Fig. 99. I. Lozhnyy joint of thigh with closed break 7 months after trauma.

page 400k.

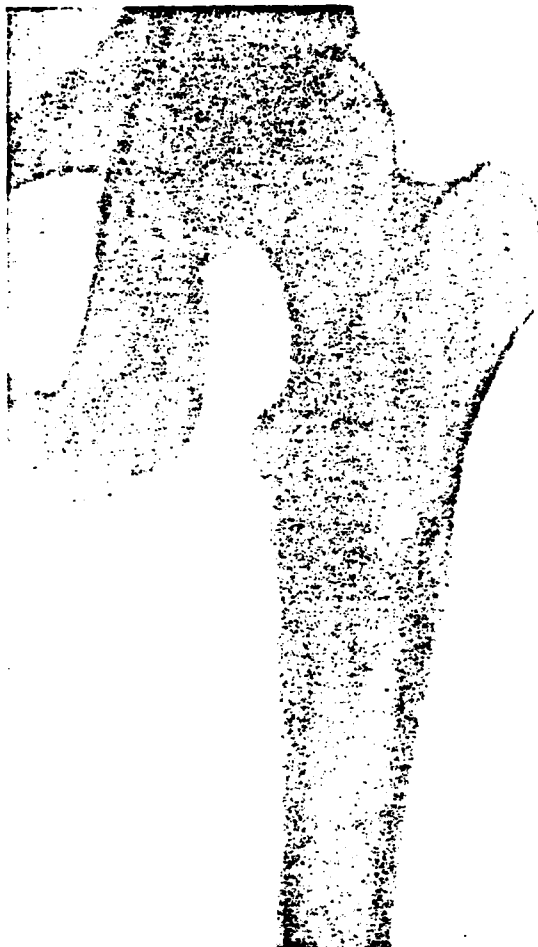


Fig. 100. The same injured person 3 years after operation/process.

Page 4001.

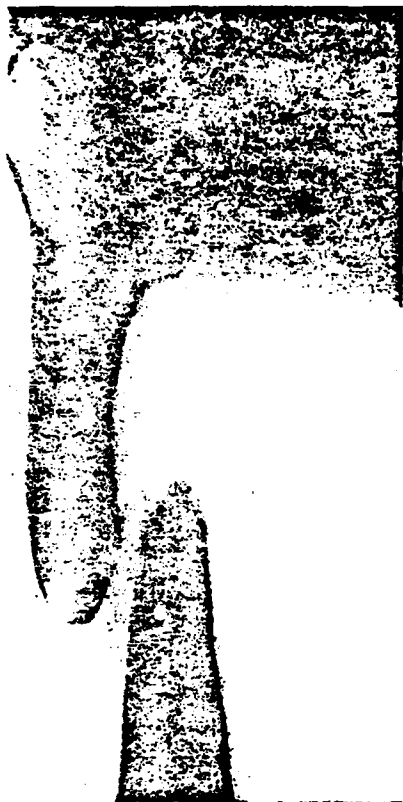


Fig. 101.

Fig. 101. T., 27 years. 4 Years after injury. False joint of right thigh.

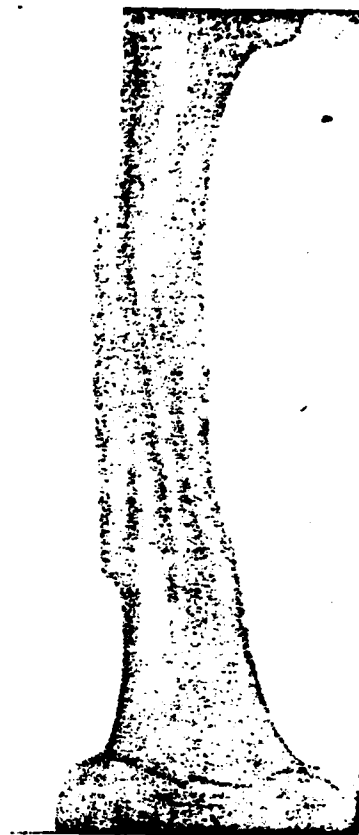


Fig. 102.

Fig. 102. The same injured person. After operation/process according to the method of intraextramedullary transplant.

Page 400m.

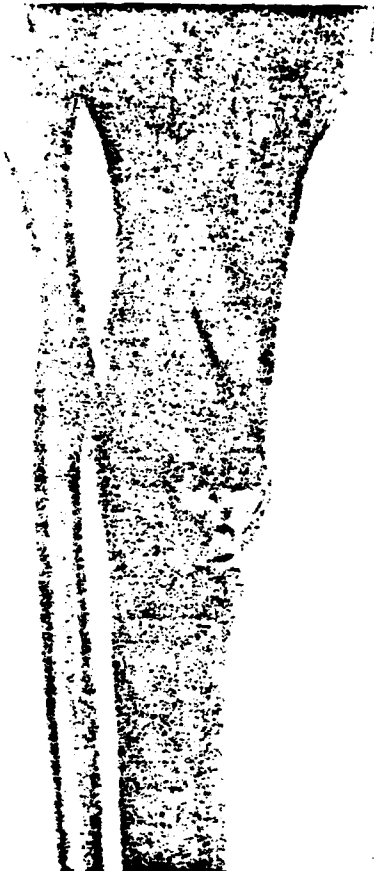


Fig. 103.



Fig. 104.

Fig. 103. B., 48 years, it is injured in 1941. X-ray photograph from 13/III 1947, produced to the operation/process. Is visible the not-grown-together break of right tibia.

Fig. 104. The same injured person 4 months after operation/process according to Beck and substitution of defect of spongy tissue.

Page 400n.



Fig. 105. K. Break of left tibia. False joint to the operation/process (20/XII 1945).

Page 400o.



Fig. 106.

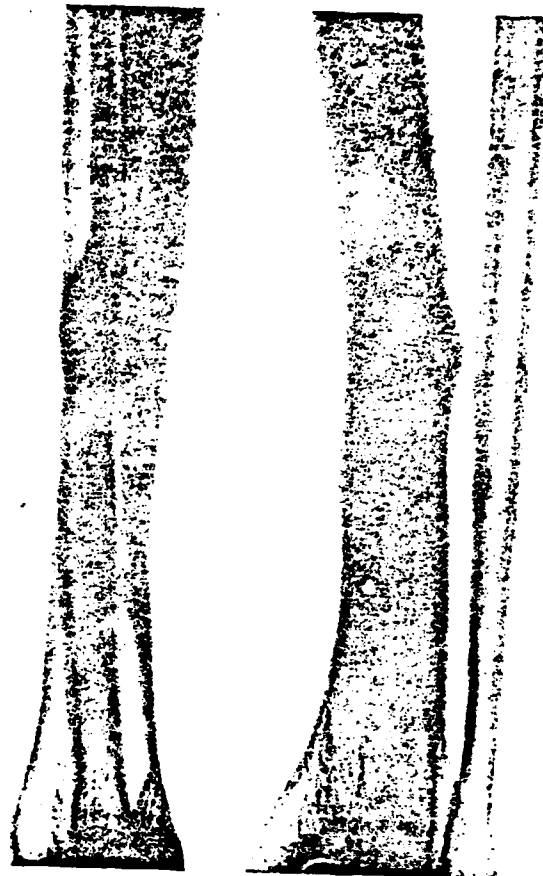


Fig. 107.

Fig. 106. The same injured person 2 months after operation/process according to method of scvable transplant.

Fig. 107. The same injured person. 2 Years after operation/process. Full/total/complete reduction of the continuity of bone.

Page 400p.

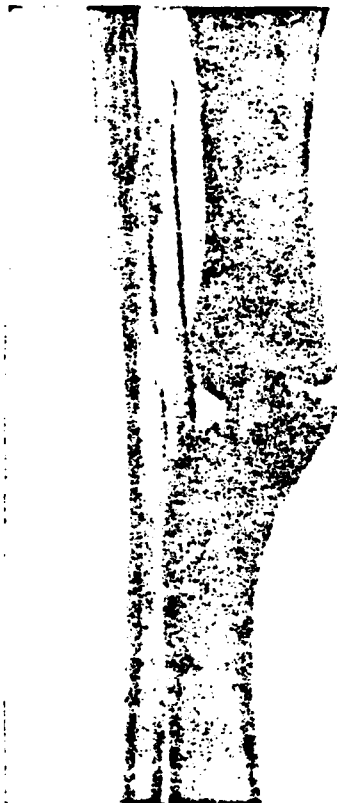


Fig. 108.



Fig. 109.

Fig. 108. False joint of right tibia (photograph is made 17/II 1948).

Fig. 109. The same injured person. After operation/process according to the method of movable transplanted, fixed/recorded by screws/propellers from the "pure/clean bone".



Page 400q.

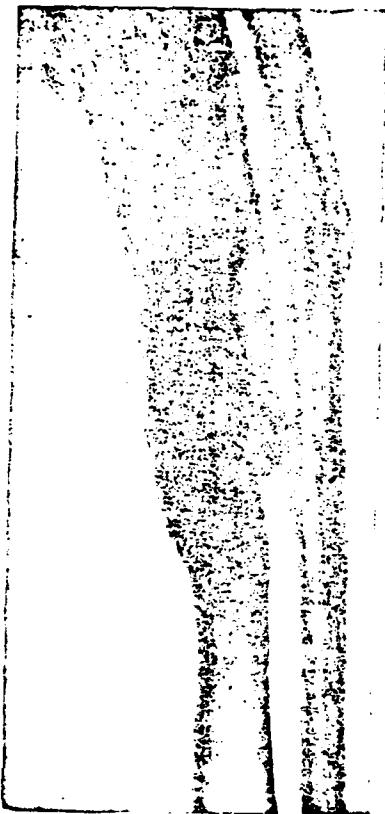


Fig. 110.

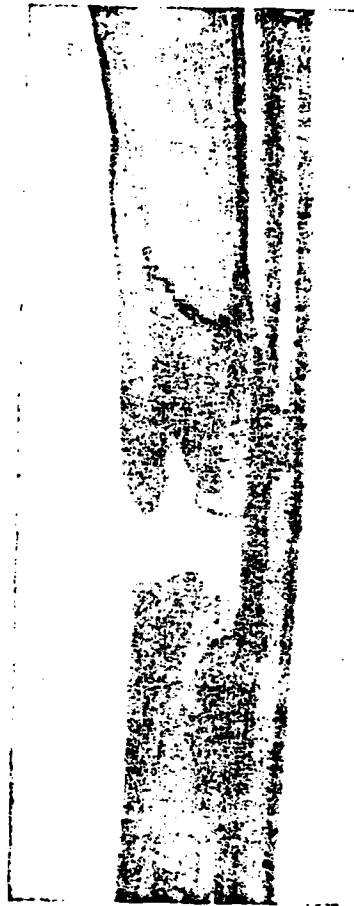


Fig. 111.

Fig. 110. The same injured person. After operation/process.  
Coalescence of break.

Fig. 111. K., 36 years. Defect of the left tibia 3 years after  
injury.

Page 400r.

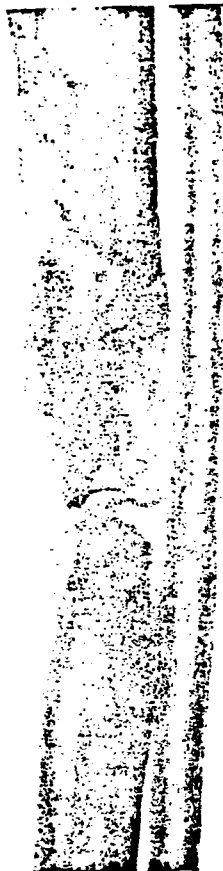


Fig. 112. The same injured person. 5 Months after operation/process according to the method of the movable transplant, fixed/recorded by screws/propellers from the "pure/clean bone". There is a reduction of the continuity of bone.

Page 400s.

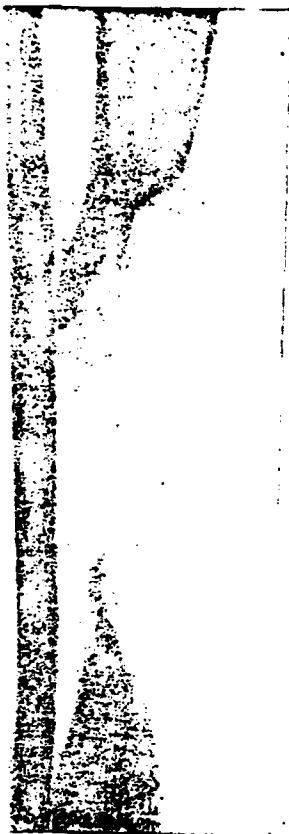


Fig. 113.

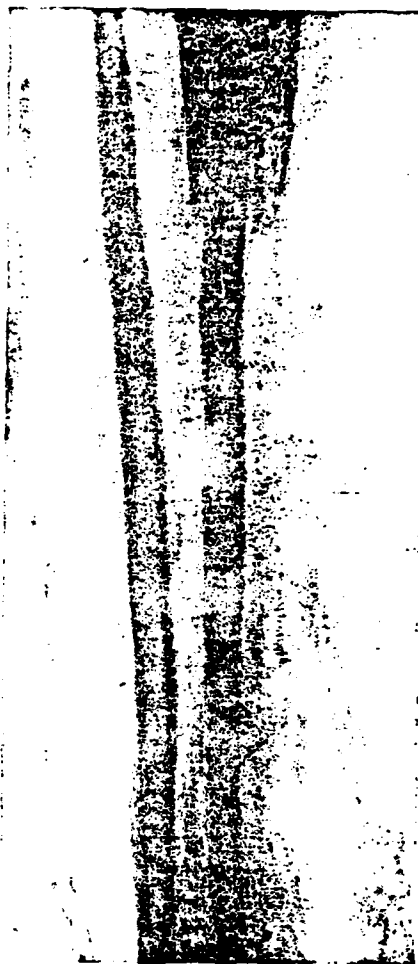


Fig. 114.

Fig. 113. Ch. Defect of right tibia in 18 cm through 1 year of 3 months after injury.

Fig. 114. The same injured person. 2 Months after the operation/process of bone of plate by the autotransplant, undertaken from the comb of the tibia of healthy/sound foot.

Page 400t.

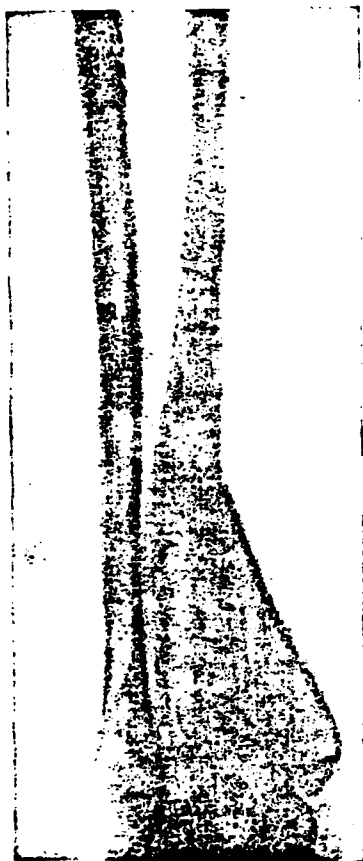


Fig. 115.

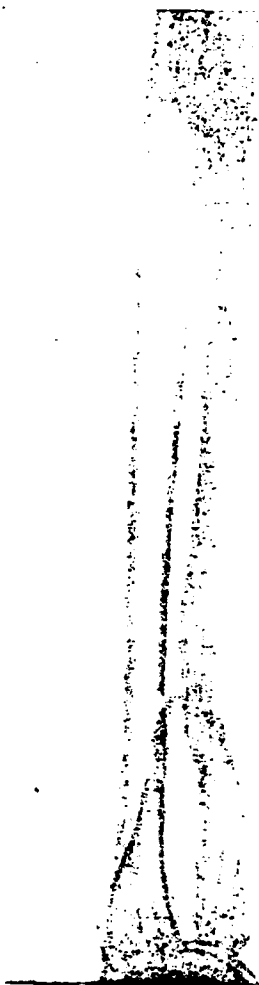


Fig. 116.

Fig. 115. The same injured person. After operation/process began the reduction of the continuity of bone.

Fig. 116. The same injured person. From the overloading was formed pseudoarthrosis in the proximal part of the transplant.

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With the considerable shortening of extremity due to the defect of bone, the considerable cicatricial regeneration of soft tissues with the disorder of blood circulation and the ankylosis of knee joint, during the damage of sciatic nerve with the trophic disorders of extremity the operation/process had relative readings, since all this was questioned its success.

The outbreak of the silent infection it was possible to expect on the thigh more frequently than on other segments, in view of the frequently deep localization of its focus in the thickness of muscles or, it is more frequently, in the thickness of scar tissue. Therefore preparation for the operation/process with pseudoarthroses of thigh was more lasting and it is more difficult.

In 1946 in the Central institute of traumatology and orthopedics there was the sole case of death of injured person after the operation/process of bone plastic surgery.

T., 21 year, is injured 18/VIII 1944. In 6 months in the

evacuation hospital is produced the extensive resection of the ends of the bone fragments. After operation/process there was soon the erysipelalous inflammation of the affected extremity. In the same year of wound they were closed. The reductions of bone after resection did not begin.

In the central institute of traumatology and orthopedics the injured person entered after injury and through half a year after resection. In the X-ray photograph is discovered the defect of bone in 10 cm (Fig. 97); injured person was discharged without the operation/process, since after erysipelalous inflammation it passed little time. Through the half a year injured again it entered into the institute. To the operation/process it was found under the observation of 1 1/2 months. Were applied all available methods of the development/detection of the silent infection, which gave negative result.

12/VI 1946 to injured person was produced the operation/process of bone plastic surgery by the autotransplant with a length of 15-16 cm, undertaken from the fibular bone of the same extremity. After the refreshment of bone scrap the transplant was introduced into the marrow canal of central and peripheral break according to the method of intra-medullary pin (Fig. 98). Wound is filled by streptocide. Technically operation/process presented no difficulties. During the

operation/process from Rubtsov in the place of pseudoarthrosis were undertaken, as usual, the small pieces for the seeding/inoculation, which gave subsequently an increase in the streptococcus.

Injured person it perished next day from the with lightning speed flamed up infection with gas generation. The undertaken after death seeding/inoculation from the region of operating wound revealed/detected an increase in the hemolytic streptococcus.

It is known that the erysipelatous inflammation frequently recurs. These relapses of erysipelas is actual/real nothing else but the periodic outbreak of the "silent" infection, which remains in the lymphatic slits and the vessels of skin.

With the presence of infection and the short period, which passed from the moment/torque of the healing of wound on the thigh, one should not have performed the operation/process of bone plastic surgery. But if for the liquidation of osteomyelitis was employed radical surgery, in such injured people it was possible to incidentally produce comparison of scrap and fixation by their catgut, i.e., simplest, least traumatic method.

Not in one of that observing in the central institute of traumatology and orthopedics of injured people with pseudoarthrosis

of thigh was not applied after carving Rubtsov preliminary flap skin plastic surgery, as this was necessary to make with pseudoarthroses of the bones of shin and forearm, because in all injured people after carving Rubtsov it was possible to close the formed defect with plastic surgery by local tissues.

The method of surgical intervention was selected in accordance with the anatomical changes in each injured person.

In injured people without the defect the bones were limited to carving Rubtsov between the scrap, the refreshment of the ends of the fragments, the comparison and the osteosynthesis by their plates with the screws/propellers from the "pure/clean bone", Vitallium, plastic, and by N. V. Sklifosovskiy's also "Russian lock" with the subsequent immobilization in the gypsum bandage.

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"Russian lock" for the osteosynthesis of thigh not only played large role in the specific stage, but it continues to remain also subsequently one of the best methods of osteosynthesis.

The refreshment of bone scrap according to N. V. Sklifosovskiy's method was conducted by the lateral stepped resection, which goes to



the marrow cavity. Scrap were laid on each other by the refreshed, well supplied with the blood parts. The contact of scrap was established on the elongation/extent 2.5-4 cm. This method gave the possibility to attain a precise comparison and the immobilization of scrap. Fixation was conducted by screws/propellers from Vitallium, "pure/clean bone" or wire.

Disadvantage of N. V. Sklifosovskiy's method with pseudoarthrosis of thigh was the small (on 2.5-4 cm) shortening of extremity; truth, it was easily corrected by orthopedic foot-wear. Due to this deficiency/lack and technical difficulty of N. N. Burdenko's operation/process negatively it were related to the method of "Russian lock" and proposed with pseudoarthroses of thigh to put to use for the osteosynthesis wire suture.

However, it was possible successfully to put to use the method of "Russian lock" with the operation/process apropos of pseudoarthrosis of thigh, after changing only method of fixation of scrap, namely applying plates and screws/propellers from the "pure/clean bone" and Vitallium.

In all injured people, operated thus (23.10/0), apropos of pseudoarthrosis of thigh, was noted the full/total/complete intergrowth of break, true, with the shortening of extremity to 3, 4

and 5 cm.

With pseudoarthroses of small remoteness, which usually was observed with the closed breaks, to amend strains and available displacement managed more easily by the comparison of scrap end into the end, as is evident from the following observation.

I., 27 years 7/XII 1943 it is discarded from the pons by explosion wave. Was obtained the break of left thigh. 7 Months after break the victim entered into the central institute of traumatology and orthopedics with pseudoarthrosis in upper third of left thigh and shortening of extremity ca 7 cm. For the month was superimposed skeletal/skeleton stretching and then was produced operation/process under overall ether anesthesia. After the refreshment of bone scrap both ends were connected by intra-medullary pin of the "pure/clean bone".

With the inspection of injured person through 3 years in i. is discovered the full/total/complete reduction of the continuity of bone, length and form of extremity (Fig. 99 and 100).

Into the central institute of traumatology and orthopedics more frequently entered the injured people with severe inveterate pseudoarthrosis 2-3-4 - to annual remoteness, with the sharply

pronounced regeneration of the surrounding soft tissues, with the resistive contractures and the strains, which were not yielding to correction.

That presented can be illustrated by the following example.

Z., 23 years, it is injured 4/VII 1942 by the explosive bullet with the damage to the left femoral bone also of sciatic nerve. The coalescences of break did not begin.

11/IX 1943 in the evacuation hospital was produced osteosynthesis by metallic brackets. Coalescences did not occur. During July 1946 was opened/discovered trophic ulcer on the foot.

After the admission into the central institute of traumatology and orthopedics (18/XI 1946) in injured person it is discovered the sharp atrophy of the muscles of left lower extremity, scars over the front/leading and posterior surface of thigh, pathological mobility in upper third of thigh, shortenings of extremity on 10 cm, foot in the position of horse foot. Basis of the V finger/pin has trophic ulcer in 5 cm. The motion of all joints is sharply limited. To the operation/process for the month was superimposed skeletal/skeleton stretching for eliminating the strain. However, to remove strain it was impossible.

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4/II 1947 to injured person is produced operation/process. Is exposed the place of false joint, are removed three steel brackets, superimposed during the preceding/previous operation/process they are refreshed the ends of the bone scrap. Both ends are fixed/recorded by plate and screws/propellers of the "pure/clean bone". Healing smooth, break it grew together itself, but strain remained. With the inspection through 2 years it is discovered, that the injured person walks well in the orthopedic foot-wear, a little limping. 21/I 1949 z. again it entered into the institute apropos of the unhealing trophic ulcer of foot; is produced the cross-linking of nerve (6 1/2 years after injury). 3 Weeks after operation/process began the healing of ulcer.

This observation shows that even under least favorable conditions the operation/process can bring and to recovery and to considerable reduction of function.

45.00/o Of operated injured people had the damages of sciatic nerve; damages were at the very high level of thigh, to large remoteness and, on neuropathologist's conclusion, they did not give

readings to preliminary intervention on the nerve.

Some surgeons (G. I. Turner, D. A. Novozhilov) indicated that with bullet breaks one of the factors, which lead to nonhealing of break, was the disturbance/breakdown of trophic system due to the damage of nerves.

As is shown the experience of the Central institute of traumatology and orthopedics, even with the full/total/complete interruption of sciatic nerve osteoplastic operation/process and operation/process of osteosynthesis usually led to the reduction of bone.

With neuritides, neuromas and other local nerve irritants and when, on this basis, the phenomena of pathological reflex are present, was observed the inhibition of the normal running of consolidation.

With the considerable defect of femoral bone best proved to be the method of the dual intraextramedullary transplant (for the intra-medullary transplant sometimes was utilized "pure/clean bone"). This method gave in 71.00/o of injured people the reduction of the continuity of bone.

As the illustration is given the following observation.

T., 27 years, it is injured 14/V 1944 by the fragment of projectile into the right thigh with the break of bone. The intergrowth of break did not begin. After the admission into the central institute of traumatology and orthopedics 15/IX 1948 is noted the shortening of extremity on 13 cm and pathological mobility on the boundary of upper and middle third of thigh.

20/IX is produced carving Rubtsov and substitution of defect by plastic surgery by local tissues. 20/XI 1948 operation/process by the method of intraextramedullar transplant; as the intra-medullary transplant is used "pure/clean bone". Available diastasis is removed by the approach of central and peripheral break. Upon the examination/inspection in a year is discovered the full/total/complete intergrowth of bone (Fig. 101 and 102).

In the Sverdlovsk institute of restorative surgery P. R. Bogdanov during the treatment of pseudoarthroses of thigh with the defect of bone in 17 injured people, who did not cause suspicions to the residual wound silent infection, successfully applied intraosseous/intraosteal/endoosteal pinning by iron core with the additional massive autotransplant. In the Moscow urban orthopedic hospital No 4 V. D. Chaklins were obtained good results during the

treatment of pseudoarthrosis and defect of femoral bone by the method of extraintramedullar transplant.

In the Central state traumatological institute of the name of R. R. Vreden G. Ya. Epstein when the treatment of pseudoarthrosis of thigh and the defect of bone is present, put to use the recommended with them method of transplant-brace.

In the Riga institute of orthopedics A. N. Machabeli utilized as the pin a fibular bone and "pure/clean bone".

As the especially important moment/torque was considered the application of gypsum dressing that it was assumed/set part to surgeon himself. Internal fixation of fragments was supplemented by reinforcement and external fixation by gypsum.

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Bandage must be well simulated without the wadded packing - wadding was placed only in the places of bone prominences. High value had the continuity of immobilization in the gypsum bandage to the full/total/complete reduction of bone. The exchange of gypsum bandage was conducted rarely - only from the specific readings, for example, during the disturbance/breakdown of its integrity. During the happy

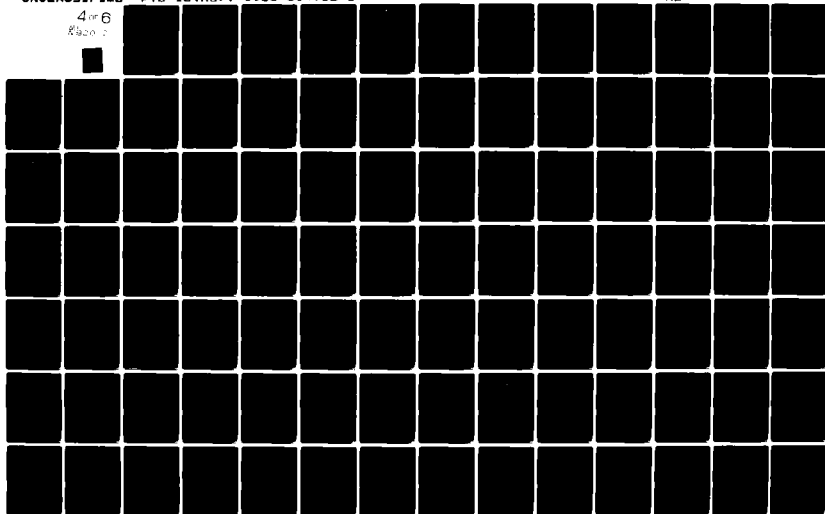
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course the bandage is left for 2-3 months. Each exchange of gypsum bandage was serious intervention and had to be conducted by surgeon, who made operation/process, with the observance of all precautionary measures in order not to destroy the integrity of the generating young corn.

For exciting the regeneration of bone in the post-operation period was given full-valued nourishment, was applied the transfusion of blood, UVCh therapy.

Given by many surgeons different results after operation/process are explained by the mainly fact that the operations/processes were conducted within different periods after injury, and also by the diversity of the entered patients, by use/application or by nonapplication of antibiotics and antiseptics.

According to the data of the central state traumatological institute of the name of R. R. Vreden (G. Ya. Epstein), operation/process with pseudoarthroses the thighs in 76.00/o of injured people ended by the coalescence of bone.

Results of operation, produced in the central institute of traumatology and orthopedics, with pseudoarthroses and defects of thigh after bullet breaks were following: the coalescence of bone -

in 58.0o/o of injured people, the absence of coalescence - in 19.0o/o; result was unknown in 23.0o/o.

The percentage of coalescence (58.0) with pseudoarthroses of femoral bone was below than with pseudoarthroses of the bones of other segments of extremities. Furthermore, these issues cannot be placed into the heading of good results, since the majority of injured people remained with the shortened extremity, with damage and absence of the reduction of sciatic nerve, with the limitation of the mobility of knee joint. Nevertheless injured people one ought not to have recommended operation/process, since after the set in coalescence they walked in the orthopedic foot-wear, and this much more easily and it is more convenient than to put to use apparatus.

If results of operation were unsuccessful, after the appropriate time was conducted repeated operation/process.

#### PSEUDOARTHROSES AND BONE DEFECTS OF THE BONES OF SHIN.

Nonhealing was observed most frequently with the break of tibia (2.8o/o), most rarely - with the break of fibular (1.8o/o), almost so frequently as with the breaks of the tibia, was noted nonhealing with breaks of both bones (2.7o/o).

From a total quantity of pseudoarthroses of the bones of shin 50.50/o composed pseudoarthroses of one tibia 16.50/o - one fibular bone and 33.00/o - both bones.

At injured people at different fronts of the Great Patriotic War the percentage of the bullet damages of the bones of shin with the basic issue into pseudoarthrosis oscillated in limits of 0.6-5.2. This oscillation more frequently corresponded to the heaviest bullet breaks of the bones of shins - large-splintered and crushed, which most frequently were complicated by pseudoarthrosis.

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Thus, the percentage of large-splintered breaks along the separate fronts composed 18.9-40.1, and crushed - 15.2-35.2. However, were noted the noncoincidences when with a smaller number of crushed breaks of pseudoarthroses it was more (Leningrad and Karelian Front) or with a larger number of crushed breaks of pseudoarthroses it was less (Kalinin, 2nd Ukrainian Front, etc.).

Where a number of pseudoarthroses did not coincide with a quantity of crushed and fragmented breaks, they acted, apparently other factors: the condition of nourishment (Leningrad Front), excessively radical primary surgical processing, insufficiently good

immobilization, etc.

Pseudoarthroses of the bones of shin as a result of the considerable displacement were encountered rarely, especially with the integrity of fibular bone. With the simultaneous break and the fibular bone the latter, being it is surrounded by the mass of muscles, was coalesced more rapidly. When fibular bone remained undamaged/uninjured, it held scrap of the tibia from the considerable displacement. However, holding scrap of the tibia at a distance, it served as if spacer, which impeded the coalescence of break.

The disturbance/breakdown of the function of extremity with pseudoarthroses of the bones of shin was usually expressed less than on the thigh. Injured people sometimes put to use their defective extremity. With the integrity of fibular bone she became the support of extremity. In many injured people was observed the bending of the axis of shin. Most frequently was encountered the curved bending, turned by convexity towards the outside; with the breaks on the boundary of lower and middle third occurred the bendings, also, at the angle, opened toward the rear; with the break in middle third - bendings at the angle, opened toward the front.

The mobility of scrap was found in the dependence on the form/species of pseudoarthrosis. Usually with pseudoarthroses of the

tibia with the undamaged/uninjured fibular bone or with its begun intergrowth disorders were not sharply pronounced, with exception of injuries with the considerable defect of the tibia.

As a result of the bending of the axis of extremity was disturbed the statics with the subsequent changes in the talocrural joint. Fibrous joint held scrap in the contact, but load caused sickness and aggravated the weakness of extremity.

According to the data of the development of the histories of disease/sickness/illness/malady, the associated damages of nerves with pseudoarthroses of shin were encountered more rarely (13.20/o) than with the breaks without the presence of pseudoarthrosis (19.60/o). In this case in 2/3 all injured people was noted the damage of fibular nerve, in 1/3 - several nerves or one tibial.

It is possible that these damages of nerves, which did not cause such sharp disturbances/breakdowns of function as in other divisions of extremity, were not always diagnosed in the early stages of treatment. It is doubtless, however, that the percentage of them is considerably lower than with the injuries of upper extremities. Consequently, the injury of nerves, apparently did not inhibit the formation of the callus.

With pseudoarthrosis of one fibular bone of the disturbance/breakdown of function usually it was not observed, with exception of nonhealing in the region of joint fork. Readings to the operation/process these injured people did not have.

In some injured people pseudoarthrosis of fibular bone was detected accidentally.

V. entered apropos of femoral arteriovenous aneurisms. In anamnesis there was a bullet injury of shin. In the process of examination/inspection is produced the X-ray photograph of shin; is discovered nonhealing of fibular bone in middle third.

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No complaints in regard to this injured person presented. After happily operation/process apropos aneurisms the injured person returned to his work. No complaints in the relation to discovered pseudoarthrosis on the part of injured person it was.

Methods of surgical intervention with pseudoarthroses of the bones of shin.

In the satisfactory state of skin and soft tissues, the absence

of defect and fibrous intergrowth between the scrap was conducted Beck's operation/process. In the region of pseudoarthrosis in this case was done a large quantity of courses.

With the operation/process the place of pseudoarthrosis additionally was bordered by the small pieces of spongy tissue for an improvement in the regeneration of bone.

As an example is given the following observation.

B., 48 years, it is injured in 1941 by the fragment of projectile into the left thigh and the right shin. It underwent the amputation of left thigh in upper third apropos of gas gangrene. To the right shin after primary surgical processing was superimposed the gypsum bandage, which held about 6 months. After the removal/taking of gypsum bandage is discovered nonhealing of both bones of shin.

After the admission into the Central institute of traumatology and orthopedics the injured person had amputated stump of left thigh in upper third. Considerable bending of right shin with the convexity, is turned towards the outside; over front-external surface of middle third of shin three scars, soldered with the subject tissues. Pathological mobility in middle third of the tibia. In the X-ray photograph (13/III 1947) was determined the not-grown-together

break of the tibia in middle third (Fig. 103). For the elongation/extent of one third of diameter of bone was a comparison of scrap, between them slit. For the remaining elongation/extent the defect between them by the size/dimension of 2-2.5 cm.

In B. is preliminarily produced the correction of the sharply pronounced strain via line-of-communication redressment with the application of gypsum dressing.

14/X 1947 under pentovillow intravenous anesthesia/narcosis is produced operation/process. Is exposed the place of pseudoarthrosis. By electric drill in central and peripheral break are made on 14-15 courses to the autopsy of marrow canal. Then chisel repelled the small piece of cortical layer in metaphysical part of the tibia and are undertaken several small pieces of spongy tissue, which was packed with the small pieces of the repelled cortical road metal in the place of the defect between the scrap. Laminar stitching. Gypsum bandage to upper third of thigh. Post-operation course is smooth. Primary adhesion. Began the full/total/complete coalescence of break (Fig. 104).

Many surgeons (N. M. Priorov, M. O. Fridland, D. K. Yazykov et al.) during the treatment of pseudoarthrosis of the bones of shin applied the method of movable transplant.



In the Central institute traumatologies and orthopedics with pseudoarthroses of the bones of shin with the defect, which did not exceed 6-8 cm, most frequently (47.60/o) put to use the method of the slipping (movable) autotransplant. It gave the best results, subjecting not to the least risk the undamaged/uninjured extremity. Even during the moderate outbreak of the silent infection occurred the reduction of bone. In 87.00/o of the injured people, operated according to this method, was observed the coalescence of break, in 3.00/o of coalescence it did not occur, in 10.00/o result were not known (Fig. 105, 106 and 107).

In those operated in recent years were obtained the best results, than in the wartime and in the first years after war. This is explained by weakening infection in view of the increase in the period, which passed from the moment/torque of injury, and conducting the course of penicillinotherapy, and also by certain change in the procedure of operation/process, which gave the possibility to obtain a good internal fixation of transplant by screws/propellers from the "pure/clean bone" or Vitallium (Fig. 108, 109 and 110).

Furthermore, with the method of the slipping transplant the available defect was filled with the small pieces of the spongy tissue, undertaken from upper metaphysis of break after the removal/taking of the cortical layer whose small pieces also were placed in the place of defect. Spongy tissue and small pieces of road metal contributed to the formation of corn.

It is necessary to consider the high value of a good fixation. Besides the fixation by screws/propellers from the "pure/clean bone", is necessary prolonged up to the full/total/complete reduction of bone immobilization in the gypsum bandage, independent of the periods which would be required to this. In all injured people with the full-valued fixation in the gypsum bandage, whom were maintained/withstood in the hospital under the observation, were obtained incomparably best results, than in those which they discharged in the gypsum bandage under the dispensary observation.

K., 36 years, it is injured during February 1944 by the fragment of projectile into the left shin with the break of the tibia. In PPG is produced the primary surgical processing of wound, is superimposed gypsum cast to middle third of thigh. During August 1944 the operation/process of sequestrectomy. During February 1945 in Kislovodsk the injured person underwent the operation/process of bone plastic surgery by the autotransplant, undertaken from the comb of

the tibia of healthy/sound shin. Festering. In 1 1/2 months the transplant is removed. Wound was closed in 6 months. During February 1947 the operation/process of the carving of cicatrix and occlusion of defect by skin plastic surgery from the right thigh (skin Filatov hauls). Graft/flap begot well. In the X-ray photograph (Fig. 111) the defect of the tibia in 4 cm in middle third. During November 1947 in the central institute of traumatology and orthopedics under pentowillow anesthesia/narcosis is produced the operation/process. Section/cut over anteroexternal surface. Is exposed the place of defect. Is cut all over the scar tissue between the scrap, the ends of the scrap are refreshed. With the aid of the electric circular saw are undertaken two transplants: one with a length of 10 cm of central break, another - in 5 cm from peripheral break to the autopsy of marrow canal. Long transplant closed the place of defect and it was fastened/strengthened by screws/propellers from the "pure/clean bone". The transplant, undertaken upon the refreshment of peripheral break, is displaced in the place of the taking of transplant from central break, From metaphysis of the tibia are undertaken the small pieces of spongy tissue and they are placed into the defect between the ends of fragments. Is produced laminar stitching of wound, to the skin are superimposed catgut sutures. Anechoic gypsum bandage to upper third of thigh. Is carried out the course of penicillotherapy. Post-operation course is smooth. Primary adhesion. In the gypsum bandage K. remained 5 months. Began the reduction of the continuity

of bone (Fig. 112).

Of 30 injured people, operated according to this method, only in one noted nonhealing of break and in one was obtained coalescence from one end of the displaced transplant and nonhealing - on the other hand.

With the large defects of bone usually was considerable decomposition of soft tissues. With pseudoarthrosis of the bones of shin it is more frequently than on other segments of extremity, were encountered the necroses of skin, ulceration/pitting of skin with the subsequent formation of motionless ones Rubtsov, soldered with the bone. To the operation/process of bone plastic surgery in 23.60/o of injured people it was necessary to resort to the operation/process of skin plastic surgery, including in 20.00/o - by Filatov graft/flap.

In injured people with the considerable defect of bone it was not the possible to put to use the method of movable transplant and to borrow transplant in one of the short scrap, it was necessary to take transplant from the comb of the tibia of healthy/sound skin.

Presentation is illustrated by the following observation.

H., 22 years, it is injured 16/III 1944 by the fragment of

projectile into the right shin with the break, the tibia. 16/IV 1944 is produced the resection of the tibia, after which for a period of 14 months the injured person transferred 6 sequestrectomies. During June 1945 it entered into the central institute of traumatology and orthopedics apropos of the defect of the tibia in 18 cm (Fig. 113).

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19/VII is produced operation/process. Is exposed the place of defect by section/cut along the anteroexternal side of skin. cut all over the scar tissue between the scrap, ends are refreshed to the autopsy of marrow canal. From the comb of the tibia of healthy/sound foot is undertaken the transplant with a length of 24 cm by which are connected proximal and extremital scrap. The proximal end of the transplant is inserted into the marrow canal of proximal break of tibia bone, and peripheral end is fastened with the the peripheral break of the tibia on the pad, made on the tibia with the autopsy of marrow cavity (Fig. 114). Healing is smooth. In 9 months in the X-ray photograph is discovered the reduction of the continuity of bone (Fig. 115). In view of the fact that the thickness of the restored/reduced bone was insufficient in order to bear the load of body was ordered busbar-core apparatus without which to injured person it was is categorically prohibited walk. Through 1 year of 2 months the injured person was into the central institute of

traumatology and orthopedics, moreover he stated that it walks without the apparatus, on in the foot appeared the pain, such as the considerable trauma of extremity in this case it did not note. The produced X-ray photograph indicated the presence hardly noticeable crack in the middle transplant. Injured person was placed into hospital the photograph, produced in a month, were indicated already clear illumination in the place of the former crack and formation in this place of pseudoarthrosis. Is superimposed gypsum bandage (Fig. 116).

The best method with the large defects was the method of dual intraextramedullar transplant, which gave more reliable fixation of break and good reduction of bone. The half injured people with the considerable defect of the tibia was operated according to this method; in all were observed good final results.

With the bullet breaks with the considerable decomposition of bone and soft tissues with the subsequent prolonged festering and Rubtsov by the regeneration of tissues the transplantation of free massive autotransplant had few chances to the success. it was necessary to resort to "bypass" type operations/processes.

As the illustration of this operation/process can serve the following observation.

Z., 28 years, it is injured 22/VII 1943 by bullet into the left shin. On DNP is produced the carving and the dissection of wound. Through 3 weeks reworking of wounds. 15/XI 1943 the extensive subperiosteal resection of the tibia.

After the admission into the central institute of traumatology and orthopedics 15/IV 1944 is noted the considerable strain of shin due to the absence of the section of the tibia on the elongation/extent 20 cm. In the center of shin the scar, united with the subject tissues. In the middle scar ulcer. In the X-ray photograph is determined osteomyelitis of peripheral break.

Preliminarily (10/V) is produced the operation/process of the carving of scar and ulcer. Plastic by local tissues. Healing is smooth. Injured person for 4 months is discharged home.

After reengagement during September 1947 was produced the operation/process of bone plastic surgery. Semi-circular section/cut with convexity towards the outside began over the anteroexternal surface of upper third of shin and was continued down through the skin and the soft tissues with a length of 25-28 cm. In the upper part is produced the osteotomy of the fibular bone its lower than

head, the extremital end of the fibular bone is inserted into the narrow canal of proximal break of the tibia.

From the comb of the tibia of healthy/sound shin with the aid of electric circular saw is prepared bone transplant in 25 cm which additionally connected proximal and extremital scrap of the tibia. Post-operation course is smooth. Injured person was situated in the hospital under the observation of 4 1/2 months. Before the extraction is noted the absence of mobility in the place of the former defect. It is discharged in the gypsum bandage.

This operation/process of M. S. Zhukhovitskiy, having the advantages before the operation/process Ghana, it is shown, where was retained the mobility of talocrural joint and it was not Rubtsovs changes in the skin. It gave best safety and it did not disturb the statics of talocrural joint.

With pseudoarthrosis of bones the shins of complication in the post-operation period were encountered considerably less frequent than with pseudoarthroses of other segments of extremity. Festering composed 22.0o/o.



In 1946-1947 the festering was observed after the produced operations/processes only as rare exception/elimination. This is explained by an increase in the period, which passed with the moment/torque of injury and with the moment/torque of the healing of wound, and also by the more wide application of penicillinotherapy. Complications from the side of peripheral nerves were noted rarely.

According to the observations of the Central institute of traumatology and orthopedics, after different operations/processes apropos of pseudoarthrosis of the bones of the shin of bullet origin were obtained the following results: the coalescence of break - 73.00/o, the absence of coalescence - 11.10/o, issue was unknown - 15.9 %.

Soviet surgeons' experience in the treatment of pseudoarthroses after the breaks of bullet origin, detailed development of operational procedure and entire complex of treatment in the the sub- and the post-operation period taking into account the activity of entire organism considerably improved the results of the treatment of pseudoarthroses.

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**Chapter VIII.**

**CONTRACTURES AND ANKYLOSIS AFTER THE BULLET BREAKS OF THE BONES OF EXTREMITIES.**

**Professor is Colonel MC I. L. Krupko.**

**Statistical survey/coverage.**

According to the data of the deepened development of the histories of disease in the Great Patriotic War in 56.60/o of injured people with the bullet breaks of the bones of extremities were observed the contractures and the limitation of the mobility of joints in the process of the treatment: with the breaks of shoulder bone - in by 68.00/o, those of the bones of forearm - in 58.00/o, femoral bone - in 57.40/o and the bones of shin - in 46.70/o.

The frequency of contractures with the breaks of the separate bones of forearm and shin was following: with the breaks of radial

bone - 60.80/o, cubital - 55.30/o, both bones of forearm - 60.90/o, tibial - 54.90/o, fibular - 50.10/o and both bones of shin - 35.80/o.

The highest percentage of the contractures, which complicated the bullet breaks of shoulder, is explained by two reasons: first, fact that the upper extremity, which fulfills very thin motions, their even insignificant limitations they already affected during the function; in the second place, by the presence in the lower division of the capsule of the shoulder joint of the synovial eversion whose walls greatly rapidly adhere, if extremity is fixed/recorded in the position of reduction. By the same is explained the fact that in contrast to other segments of extremities with the bullet breaks of shoulder by contracture was very frequently surprised not only extremital - cubital, but also proximal - the shoulder joint (Table 262).

Furthermore, it is necessary to note that the frequency of contractures was found in direct dependence on the frequency of the full/total/complete breaks, which were being observed on each segment (that is, pg. 217, 276, 332 and 452 present works). Thus, for instance, 68.00/o of contractures in the breaks of shoulder corresponded to 88.90/o of full/total/complete breaks, and in the relation to the bones of shin with respect to 46.7-77.40/o.

According to the data of author's development, most frequently the contractures were developed in nearest extremity from the place of break joint (81.4o/o), less frequent - in the proximal (38.9o/o) and still less frequent - in the extremity joints, removed from the place of break (17.5o/o).

Information on the separate segments is represented in Table 262.

The preponderance of the contractures of the extremity joint above the contractures of proximal is especially is distinctly evident on the breaks of lower extremity. The nearer to the joint was arranged/located the break, the more frequently were noted the contractures.

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If the average percentage of contractures with the bullet breaks of the bones of extremities, as already mentioned, was equal to 56.6, then with the packed in breaks which are localized almost exclusively in the nearest to the joint metaphyseal divisions of bone, it composed 72.3.

To in exactly the same manner it is possible note the known

dependence between the frequency of contractures and the form/species of break (Table 263). With the cross breaks the contractures on the average composed 70.40/o, with the oblique ones - 69.30/o, while with the edge/boundary ones they composed 49.40/o, with the perforated ones - 51.60/o. It is completely obvious that in this case it is necessary to consider the severity of damage which frequently was found in direct dependence on the form/species of break.

Table 262. Distribution of contractures with the bullet breaks of the bones of extremities according to the separate joints (in the percentages) .

(1) Верхняя конечность			(2) Нижняя конечность		
(3) Сустав	(4) локализация перелома		(3) сустав	(4) локализация перелома	
	(5) плечо	(6) предплечье		(7) бедро	(8) голень
Плечевой (9) . . . . .	31,4	—	Тазобедренный (10) . . .	10,0	—
Плечевой и локтевой (11) . . . . .	27,4	—	Тазобедренный и коленный (13) . . . . .	16,0	—
Локтевой (12) . . . . .	33,4	16,4	Коленный (15) . . . . .	63,0	11,1
Локтевой и лучезапястный (14) . . . . .	7,8	9,8	Коленный и голеностопный (16) . . . . .	11,0	14,1
Локтевой, лучезапястный и пальцев кисти (17) . . . . .	—	19,5	Голеностопный (18) . . . . .	—	74,8
Лучезапястный (19) . . . . .	—	18,4			
Лучезапястный и пальцев кисти (20) . . . . .	—	35,9	(21) Итого . . . . .	100,0	100,0
(21) Итого . . . . .	100,0	100,0			

Key: (1). Upper extremity. (2). Lower extremity. (3). Joint. (4). localization of break. (5). Shoulder. (6). Forearm. (7). thigh. (8). shin. (9). Shoulder. (10). Hip. (11). Shoulder and cubital. (12). Cubital. (13). Hip and knee. (14). Cubital and radiocarpal. (15). Knee. (16). Knee and talocrural. (17). Cubital, radiocarpal and fingers. (18). Talocrural. (19). Radiocarpal. (20). Radiocarpal and fingers. (21). Altogether.

Table 263. Frequency of the complications of the contracture of the ballet breaks of the bones of lower extremity in the dependence on the form/species of break (in the percentages).

(1) Вид перелома	(2) Локализация перелома	
	(3) бедро	(4) голень
(5) Вколоченный . . . . .	83,8	63,6
(6) Косой . . . . .	78,8	60,9
(7) Поперечный . . . . .	75,1	57,6
(8) Крупнооскольчатый . . . . .	70,2	66,9
(9) Мелкооскольчатый . . . . .	67,2	60,9
(10) Дырчатый . . . . .	60,9	42,1
(11) Продольный . . . . .	57,2	51,1
(12) Краевой . . . . .	50,3	43,3
(13) Раздробленный . . . . .	33,3	22,1

Key: (1). Form/species of break. (2). Localization of break. (3). thigh. (4). shin. (5). Packed in. (6). By scythe. (7). Cross. (8). Large-splintered. (9). Small-splintered. (10). Perforated. (11). Longitudinal. (12). Edge/boundary. (13). Crushed.

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Is focused attention, what smallest percentage of contractures was observed with the heaviest breaks - crushed; this because with the crushed breaks frequently it is necessary to make amputation earlier than have time to develop contracture.

It was not noted the direct dependence between the frequency of

contractures and the measures of preventive character/nature, for example, between the periods of rendering of first aid and of imposition of transport immobilization, the character/nature and the time of production in the primary surgical processing/treatment, since all these measures were conducted depending on the severity of damage (break), and contractures were the consequence not only of the severity of break, but also emergent with them complications which it was not always possible to arrest by measures indicated above.

To the such larger degree it is possible to notice connection/communication of contractures with the therapeutic measures which equally were applied for the liquidation of the severity of damage and for the liquidation of the emergent complications.

This can be illustrated based on the example to available connection/communication between the character/nature of therapeutic immobilization and the frequency of contractures and ankylosis in the issues of bullet breaks (Table 264).

From Table 264 it is evident that on all segments after the use/application of a gypsum splint of contractures and ankylosis it was less than after the use/application of a gypsum bandage.



Treatment in the gypsum splint gave the possibility to early apply therapeutic gymnastics and physiotherapy; however, without taking into account the form/species of break it is not possible to relate favorable results due to one therapeutic immobilization, since it is known that the gypsum splint was applied predominantly during the treatment of light breaks (vol. 15, pg. 266 of present work).

The continuity of treatment in the gypsum bandage was manifested favorably undergoing medical treatment of break; in particular, this can be seen on a number of contractures with the breaks of the bones of forearm (author's development).

During the treatment by the aseptic gypsum bandage, changed of 1-2 times, the contracture was revealed among the clinical issues in 12.50/o of injured people, while upon the repeated exchange of gypsum - in 25.00/o; contractures were observed in 14.30/o of injured people, whose gypsum bandage was not changed.

During the evaluation of given data one must take into account that the frequent exchange of gypsum bandage was conducted in injured people with the severe complications of the infection when frequently it was necessary to resort to repeated surgical interventions. By this in essence it is possible to explain that the fact that the contractures upon the repeated exchange of gypsum bandage were

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observed 2 times more frequently than upon the exchange of its  
one-two times in the period of treatment.

**Table 264. Frequency of contractures and ankylosis among the clinical issues of the bullet breaks of the bones of extremities, treated by different immobilization (in the percentages).**

(1) Характер иммобилизации	(2) Локализация перелома и характер осложнения							
	(3) плечо		(4) предплечье		(5) бедро		(6) голень	
	контр-актура	анки-доз	контр-актура	анки-доз	контр-актура	анки-доз	контр-актура	анки-доз
(9) Гипсовая шина . . . . .	32,1	3,0	26,4	3,0	—	—	15,0	1,5
(10) Глухая гипсовая повязка . .	41,5	4,5	30,8	4,1	53,6	9,0	28,8	3,6
(11) Вытяжение . . . . .	—	—	—	—	53,9	9,3	—	—

**Key: (1). Character/nature of immobilization. (2). Localization of break and character/nature of complication. (3). shoulder. (4). forearm. (5). thigh. (6). shin. (7). contracture. (8). ankylosis. (9). Gypsum splint. (10). Anechoic gypsum bandage. (11). Stretching.**

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At the more elderly age when tissues are less elastic, the frequency of contractures and their stability noticeably were increased.

Most of all was manifested the effect of age on the formation of contractures with the breaks of shoulder and to the smallest degree - with the breaks of forearm.

The degree of degenerate changes in the joint cartilage and, therefore, the degree of limitation mobilities with the contractures can be so considerable that in the joints are possible only hardly the noticeable oscillatory or springy motions, that can be estimated as the presence of the ankylosis of joint, has in mind fibrous ankylosis, since bone ankylosis, as a rule, is encountered upon the bullet damages of joint itself, transfers of suppuration to the joint or breaks of the bones, which penetrated the joint.

The frequency of ankylosis after the bullet breaks of the bones of extremities was the following: the breaks of shoulder - 3.7o/o of, those of the bones of forearm - 3.4o/o, thigh - 7.0o/o, and the bones of shin - 2.5o/o; on the average - 3.8o/o.

The frequency of ankylosis after the breaks of the separate bones of forearm and shin is represented in chapter about the issues.

According to the data of author's development, in the general/common/total totality of ankylosis, accepted as 100, most frequently the ankylosis were developed in nearest extremity from the place of break joint (79.8o/o), is less frequent in the proximal (34.3o/o) and it is still less frequent in distant from the place of break extremity joints (22.4o/o).

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Law this is expressed completely distinctly on all segments of  
extremities (Table 265).

Table 265. Distribution of ankylosis after the bullet breaks of the bones of extremities according to the separate joints (in the percentages).

(1) Верхняя конечность			(2) Нижняя конечность		
(3) сустав	(4) локализация перелома		(5) сустав	(6) локализация перелома	
	(5) плечо	(6) предплечье		(7) бедро	(8) голень
Плечевой (9) . . . . .	27,9	—	Тазобедренный (10) . . . . .	3,6	—
Плечевой и локтевой (11) . . . . .	12,5	—	Тазобедренный и коленный (13) . . . . .	15,9	—
Локтевой (12) . . . . .	47,1	12,2	Коленный (14) . . . . .	74,5	19,8
Локтевой и лучезапястный (15) . . . . .	12,5	14,4	Коленный и голеностопный (16) . . . . .	6,0	10,4
Локтевой, лучезапястный и пальцев кисти (17) . . . . .	—	8,9	Голеностопный (18) . . . . .	—	69,8
Лучезапястный (19) . . . . .	—	24,5	(21) Итого . . . . .	100,0	100,0
Лучезапястный и пальцев кисти (20) . . . . .	—	40,0			
(21) Итого . . . . .	100,0	100,0			

Key: (1). Upper extremity. (2). Lower extremity. (3). joint. (4). localization of break. (5). shoulder. (6). forearm. (7). thigh. (8). shin. (9). Shoulder. (10). Hip. (11). Shoulder and cubital. (12). Cubital. (13). Hip and knee. (14). Knee. (15). Cubital and radiocarpal. (16). Knee and talocrural. (17). Cubital, radiocarpal and fingers. (18). Talocrural. (19). Radiocarpal. (20). Radiocarpal and fingers. (21). Altogether.

The nearer to the joint was arranged/located the break, the more

frequently were noted the ankylosis. If the average percentage of ankylosis after the bullet breaks of the bones of extremities with the extraction of injured people from the hospitals, as already mentioned, was equal to 3.8, then with the packed in breaks which were localized understand exclusively in the nearest to the joint metaphystic divisions of bone, it composed 6.4.

However, one nearness of break to the joint was not decisive in the frequency of the development of ankylosis. Such breaks, as perforated and edge/boundary, were encountered predominantly in extremital and proximal third, nevertheless with these breaks most rarely were encountered ankylosis (table 266).

From Table 266 it is evident that the ankylosis more frequently were encountered with the full/total/complete breaks and less frequent - with the incomplete ones, moreover among the full/total/complete breaks it was not possible to secrete such, which on all segments would be accompanied most frequently by ankylosis, because, besides the considerable destruction of bone, was necessary the nearness of the break to the joint, in particular to the extremital.

For the illustration of this in the relation to shoulder is given Table 267 with the information about the breaks, with which

most frequently were observed the ankylosis.

From Table 267 it is evident that the packed in, cross and crushed break most frequently was encountered in upper or lower third; the large/coarse and small-splintered break although it was observed most frequently in middle third, nevertheless from extreme thirds in the frequency predominated extremital third above the proximal. The same was observed also on other segments.

The information about the frequency of ankylosis and contractures with the breaks, which penetrate into the joint, is given in chapter about the issues.



Table 266. Frequency of the onset of ankylosis after the bullet breaks of the bones of extremities in connection with the form/species of break (in the percentages).

(1) Вид перелома	(2) Локализация перелома				
	(3) Плечо	(4) Предплечье	(5) Бедро	(6) Голень	
(7) Вколоченный . . . . .	8,0	11,1	5,9	—	
(8) Косой . . . . .	2,8	3,7	8,1	4,5	
(9) Поперечный . . . . .	4,9	1,1	9,0	—	
(10) Крупнооскольчатый . . . . .	4,1	3,6	8,1	4,0	
(11) Мелкооскольчатый . . . . .	4,3	3,7	7,8	2,9	
(12) Дырчатый . . . . .	3,3	0,6	5,0	0,5	
(13) Продольный . . . . .	—	7,3	9,1	2,3	
(14) Краевой . . . . .	2,7	1,8	2,6	2,2	
(15) Раздробленный . . . . .	4,7	6,2	9,0	1,2	

Key: (1). Form/species of break. (2). Localization of break. (3). Shoulder. (4). Forearm. (5). Thigh. (6). Shin. (7). Packed in. (8). By scythe. (9). Cross. (10). Large-splintered. (11). Small-splintered. (12). Perforated. (13). Longitudinal. (14). Edge/boundary. (15). Crushed.

Table 267. Frequency of some forms/species of the bullet breaks of shoulder at the different levels (in the percentages).

(1) Уровень перелома	(2) Вид перелома				
	(3) вколоченный	(4) поперечный	(5) крупнооскольчатый	(6) мелкооскольчатый	(7) раздробленный
(8) Верхняя треть . . . . .	1,3	3,1	39,5	4,7	20,5
(9) Средняя " . . . . .	0,4	4,7	48,4	7,4	18,4
(10) Нижняя " . . . . .	0,4	5,0	44,6	5,8	19,1

Key: (1). Level of break. (2). Form/species of break. (3). packed in.

(4). cross. (5). large-splintered. (6). small-splintered. (7).  
crushed. (8). Upper third. (9). Middle third. (10). Lower third.

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The development of fibrous ankylosis stood in the dependence on the same basic reasons, as the development of contractures.

In particular, had a value the expressed and prolonged inflammatory process, and also prolonged immobilization. As confirmation of the aforesaid serve data of the author's development, according to which 40.90/o of ankylosis of joints developed after the bullet breaks of the bones of extremities, which were being accompanied by abundant and prolonged festering, flows, phlegmons, etc., and 44.40/o were accompanied by osteomyelitis.

#### Classification.

The classification of contractures usually is conducted in accordance with the fact such as tissue plays preferred role in their origin. Into this basis of contracture are divided into the arthrogenous ones, the myogenic ones, dermato- and desmogenic and neurogenic (antagonistic and reflector). However, as this will be clearly from the following presentation, each contracture of bullet

origin was and arthrogenous, and myogenic, and desmogenic, i.e., by the contracture of complex in origin of which participated all tissues of the damaged extremity.

Therefore their classification must be constructed, on the basis of following data: 1) etiological (as a result of the bullet break, the thermal trauma, etc.); 2) functional (blurred or sharp disturbance/breakdown of the function of extremity); 3) the degree of development (unstable, stable); 4) the character/nature of information (bending, extensor, bringing, discharge, combined contracture).

Such characteristic of contracture which considers all these moments/torques, most corresponds to practical targets. By it as by basis they put to use in the period of the Great Patriotic War.

After the breaks of shoulder the contractures of elbow joint were most frequently combined (bending-extensor, i.e., it was total neither flexure nor straightening), moreover forearm with respect to the shoulder usually was located in the position of flexure. In the same position were observed the ankylosis of elbow joint.

With the breaks of the bones of forearm extensor contractures in the radiocarpal joint were encountered rarely and any essential

disorders of function hand they did not cause. Bending contractures were encountered they frequently and sharply disturbed the function of hand and fingers/pins. It is necessary to also note the pronation-supination contractures of the forearms which caused the considerable disorders of function. In the same positions were encountered the ankylosis.

With the breaks of the thigh of contracture and the ankylosis of hip joint were observed in the position of flexure, reduction, less frequent than the removal/diversion with the rotation vnutr6 or towards the outside. Most frequently were encountered the combined contractures in the position of flexure and reduction.

Contractures and ankylosis of knee joint after the bullet break of thigh, as a rule, were combined (bending-extensor, when it was not full/total/complete either flexure or straightening), moreover shin with respect to the thigh was located in the position of straightening that it stood in direct connection/communication with the character/nature of immobilization.

After the break of the bones of shin in the overwhelming majority of injured people the contracture and the ankylosis of talocrural joint were encountered in the form of the so-called horse foot, i.e., considerable bottom inflexion.

## Pathogenesis

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The majority of the authors (B. Ya. Brook, V. V. Gorinevskaya, I. S. Zhorov, V. O. Marx et al.) considered that by the basic and most frequent reason for the development of contracture was the incorrectly realized treatment and the mainly noncorresponding use/application of immobilization and prolonged use it. This fact, it is doubtless, had important value. However, to assign to it the decisive role there are no bases. Orthopedic practice shows that prolonged, sometimes 4-6- monthly, the stay of extremity in the gypsum bandage after different bone operations/processes did not cause the development of any resistive and expressed contracture.

Based on materials of the deepened development of the histories of disease/sickness/illness/salady, also it was impossible to note especially prolonged immobilization in injured people with the complication of contracture.

Consequently, besides the prolonged immobilization, is necessary the presence still and other reasons whose combined action leads to the development of contracture. Such reasons were: a) algesic or shi . reaction as the result of stimulating of receptors and b)

the local dystrophias of tissues, which develops, according to I. P. Pavlov's teaching, as a result of the break of reflector arc. It contributed to dystrophias, amplified its inflammatory process prolonged immobilization.

As confirmation of the aforesaid serve data of the deepened development of the histories of diseases/sicknesses/illnesses/maladies, which show the frequency of contractures in injured people after bullet break, discharged from hospital with different clinical issues. Most frequently the contractures were noted during different combinations of issues (75.40/o). This occurred with the breaks of the bones of the different segments of extremities and therefore she indicated the important value of the combinations, which call contractures and ankylosis of factors. The effect/action of each of them considerably more rarely led to the contracture or the fibrous ankylosis. Second place (58.00/o) in the frequency of the development of contractures occupies prolonged inflammatory process - osteomyelitis. In third place (49.3 %) in the frequency of the development of contractures will cost pseudoarthrosis with which was applied prolonged immobilization.

Pains, causing the so-called shielding reaction, and subsequently customary position extremities, were the permanent

reason for the development of contracture.

In the mass the bullet injuries of soft tissues in comparison with the breaks of bones flowed/occurred/lasted with the less expressed inflammatory phenomena, the infection of wound was eliminated within the shorter periods, the majority of them did not require the immobilization, especially prolonged. In other words, all basic reasons, which lead to the development of contractures with the injuries of the soft tissues of extremities, either were absent or they were insignificant.

Therefore contractures with the injuries of the soft tissues of extremities (eliminating hand and foot) were observed almost 12 times less frequent (4.90/o) than with the bullet breaks of bones (56.60/o).

The bullet damages of extremities frequently caused the states, described by N. I. Pirogov by the name of tissue stupor, or local shock. Local shock could somewhat move aside the time of the exposure of pains, but nevertheless painful reaction began and frequently heavily it was reflected both in the general state of victim and in the state of the damaged extremity.

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The appearance of a pain from the point of view of the pathogenesis of contractures indicated the onset the first - precontractural - phase of their development (I. L. Krupko, 1944). For this phase is characteristic shielding, analgesic reaction. It is caused by the instinctive tendency of victim to fix/record extremity in the position, which removes or which weakens pain. After ceases the pain, disappears analgesic reaction and, therefore, the forced position. Only with the long continuous pains shielding position, being fixed/recorded, becomes customary, and the advancing/attacking for a second time morphological changes in the tissues lead to the development of the contractures of joints. to the same contributes the long elapsing inflammatory process, and also the lasting and incorrectly carried out immobilization.

According to the investigations of A. G. Ginetsinskiy (1945), in this phase rapidly was developed the atrophy of muscles, which cannot be examined only as atrophy as a result of the inactivity, but also it is possible to assume the presence of the effects, which go from the side of the traumatized nerves. A. D. Speranskiy (1944), referring to the clinical experiments of V. N. Shamov and A. G. Molotkov, takes for granted the reflector character/nature of some post-wound contractures.

In the first precontracture phase yet it was not observed



contracture in the true sense of this word, but the presence of the conditions described above created all prerequisites/premises for its development. Changes in the tissues of a biophysics-chemical property, even if there are, then, it is doubtless, they carry the reversible character/nature. In the clinic precontracture phase is usually called algesic, reflector or active contracture, bearing in mind that at its basis lies/rests the neuromuscular report/event.

By the force of the long continuous pains, inflammatory process or immobilization the fixed/recorded position of extremity became customary. The secondary morphological changes in the tissues, which accompanied this position, and also inflammatory phenomena, which were being developed on the spot of damage and in its periphery, led to the contracture of joints. This the second phase - phase of unstable contractures.

It is difficult to establish/install the duration of period from the moment/torque of damage to the development of contracture. Virtually it did not exceed several weeks for the large/coarse joints.

The contractures at basis of which lies/rests the irreversible regeneration of tissues, are called of passive ones. Pathoanatomical investigations showed that in this phase the morphological changes

affect all tissues of extremity. These changes in the form of regeneration are well noticeable in the muscular filament (S. S. Vayl', 1944; I. L. Krupko, 1946). Inactivity or limitation of the activity of muscles, inflammatory process, stagnant edema, accompanying injuries of extremities, lead to weakening of the nourishment of muscles. Such muscles gradually lose capability for contraction/abbreviation, they are decreased in the volume and undergo degenerate regeneration. Muscular filament loses cross striation, it decomposes and is replaced connective tissue. The process indicated can be first more, then those by less expressed, but, as a rule, it seizes all muscles of extremity, but not only which were subjected to the direct effect/action of the wounding force. Muscles these are pale, with a large quantity of connective layers and during the section/cut so dense as scar tissue.

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However, not only the regenerated muscles hinder motion in the joints with the contractures. As showed pathoanatomical investigations I. L. Krupko (1944) serious changes were also in other tissues. Thus, changes were detected in the tendinous vaginas and, especially, in the joints; was noted the presence of the joints, which connect tendon with the internal wall of tendinous vagina (Fig. 117).

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Ligaments and articular bursa underwent elastic wrinkling, moreover bag in connection with the disorder of circulation frequently became edematic or strongly condensed.

A quantity of synovial fluid/liquid noticeably was decreased, its remainders/residues were thickened, and then in the joint were detected gelatinous clusters. Instead of the synovial fluid/liquid sometimes appeared the intra-articular exudation whose pH was identical to pH of edematic fluid/liquid.

In the joint were detected first tender, strongly vascularize, then the rougher connected joint surfaces of bones.

The changes indicated were most sharply pronounced in the adjacent with the trauma joint, it is more frequent extremital, but, as a rule, affected other, sometimes distant joints (Fig. 118). The development of the deep changes indicated in all tissues of the damaged extremity depended on pains, inflammatory processes, local intoxication and stagnant phenomena, i.e., as the final result from the neuratrophic factor.

Together with these secondary ones, so to say reflected, by

changes, in the tissues of regressive character/nature from the first day of injury continue the processes of regeneration on the spot of direct damage.

As is known, virtually neither muscle nor tendon regenerate. Their defect is replaced by scar. However, scar is not always absolute obstruction for the normal function of joint. If Rubtsov regenerated soft tissues, including muscles, are soldered into the single conglomerate or with the subject bone, then are formed the "third points" of the fastening of the muscles to which paid attention already N. I. Pirogov. The soldered with the bone scar exerts mechanical obstruction for the active and passive motions in the joint, which to the identical degree relates also to the scars, not soldered with the subject bone, but by presenting by itself the conglomerate of the different tissues when elastic possibilities of some of them run into the intractability of others.

Thus, for the phase of unstable contractures with the bullet injuries of extremities is characteristic the existence of two processes: one of them is the product of neuratrophic effects and consists in degenerate changes in the inflamed and nonfunctioning tissues, and the second is connected with the regeneration and consists of the formation of scar.



Fig. 117.



Fig. 118.

Fig. 117. Joints of tendon of finger/pin with internal wall of tendinous vagina (it is schematic).

Fig. 118. Connective joints in talocrural joint with bullet break of thigh (it is schematic).

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In further course of reparative process occurs the conversion of young connective tissue into the permanent fibrous scar tissue, which in the physiological sense indicates the process of the wrinkling of scar, while in the clinical manifestation - cicatrical contraction. In the surrounding joint tissues and in the tissues of entire extremity are increased the changes (both in the qualitative and in

quantitative sense), which lead to further changes in the joints of the deprived of motions extremity. The latter are evinced by an increase in number and enlargement of the intra-articular joints which are converted into the powerful/thick and strong/firm strands (Fig. 119). Frequently in this case adhered folds and eversions of the bag of joint.

Important role in the formation of intra-articular joints plays the exudation in the joints, depending on the disorders of venous and lymphatic outflow. Evidently, the deposited fibrin with the fixed/recorded joint serves as basis for forming the intra-articular joints. In this stage frequently are detected the changes, also, from the side of joint cartilages. They are expressed in its atrophy, and by the places also in the numbness. This necrotization of cartilage occurred mainly at the places of the contact of joint surfaces, which indicates the effect and of purely momentums (Fig. 120).

Together with the destruction of joint cartilages, cicatrical wrinkling it underwent the capsule of joint, ligamentous/connecting apparatus, fascias, muscles, skin, etc.

Frequently in this case tendons for the considerable elongation/extent were joined with the tendinous vaginas. This is the phase of resistive contracture.

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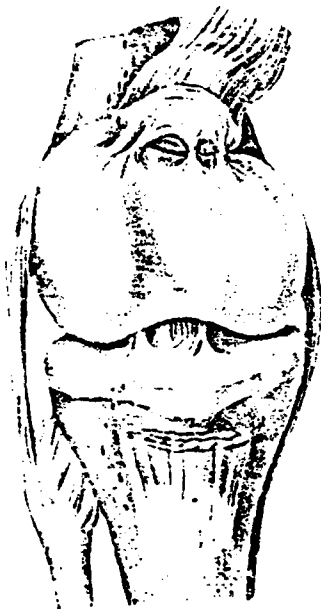


Fig. 119.

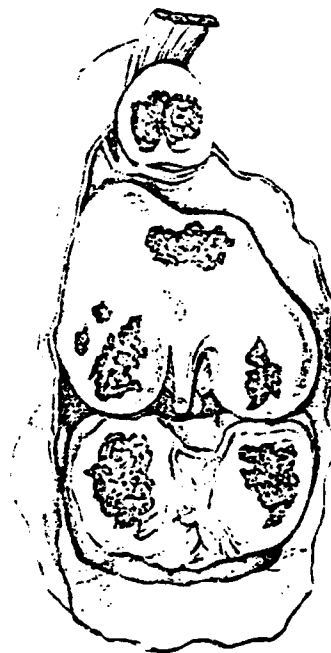


Fig. 120.

Fig. 119. Connective joints in knee joint with bullet break of thigh (it is schematic).

Fig. 120. Necrosis of joint cartilage of knee joint (it is schematic).

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In the relation to the origin of the so-called ischemic contracture there are different points of view. At its basis, apparently can lie/rest different etiological and pathogenetic factors. One of the disseminated views explains the essence of process by ischemia. Ischemia of tissues as a result of stopping of blood circulation in view of the compression or thrombosis of arterial vessels in the series/number of injured people can be proved. At the same time there are the foundations for recognizing that in some injured people the trophoneuritic and circulatory disorders appear as a result of the distortion of the function of sympathetic nervous system or with the disorders of periarterial innervation.



Was observed ischemic contracture after the break of the lower end of the shoulder, and also the injuries of forearm. Is established/installed connection/communication of the development of contracture with the tight gypsum bandage and with subfascial hematoma. Heavy internal changes in the muscles lead to the resistive barely yielding to treatment contracture. After bullet breaks ischemic contractures were encountered very rarely.

#### Prophylaxis of contractures and ankylosis.

As is known, prophylaxis of contractures and fibrous ankylosis is based on the following principles: a) the elimination of the pains, connected with the injury, and effective fight with the infection; b) the reposition of scrap, and also the timely and correctly carried out transport and therapeutic immobilization; c) the early occlusion of wound with the imposition of secondary sutures and with the method of skin plastic surgery; d) the removal/distance of the foreign bodies, which mechanically impede motions in the joint and chronically traumatizing tissues e) imparting to extremity the elevated position for warning/preventing the development of edema; f) the early use/application of the therapeutic exercise; g) the use/application of physiotherapy.

Possibilities for warning/preventing of contractures and

ankylosis after the bullet breaks of thigh were sufficiently restricted. By the immobilization of extremity in the physiological position was achieved considerable decrease or even full/total/complete elimination of the hypertonia of muscular groups and lowering the intra-articular pressure. The weakening of muscles, creating the full/total/complete rest of the damaged extremity, first of all removed the source of the onset of pains in the region of the focus of stimulation and at the same time it served as the best antipyretic substance.

Unfortunately, on the evacuation routes both the transport splints and gypsum bandages always could not be superimposed under the condition of the physiologically correct position of extremity. This rule could be observed only in the back hospitals. the correct immobilization of the damaged extremity encompasses not only the imparting of average/mean physiological position; it assumes as necessary element/call the elevated position of the damaged and immobilized extremity, since edema of extremity not only contributes to the development of contractures and fibrous ankylosis of joints, but also burdens the course of inflammatory process.

Fulfilling this requirement also met with great difficulties on the evacuation routes.

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The utilization of a secondary suture for the early occlusion of wound, the obtained wide acceptance in the Great Patriotic War with the injuries of soft tissues, on the clear reasons could not be applied with the presence of suppurative bone wound. According to the data of the deepened development of the histories of disease/sickness/illness/malady, it was applied only in 2.00/o of injured people.

The forced lasting rest of the damaged extremity is harmful for the soft tissues and the joints, since it causes in them degenerate type morphological changes. Motions compose the normal vital function of muscles and joints. The possibility of executing this function is the basic goal of the treatment of any break. However, from the first day of the application of the immobilization dressing of injured person made it necessary to produce active motions by those segments the extremities, which remained unfixed (fingers/pins feet). During the first days after injury the attempts of the injured person to produce motions were frequently expressed in the twitching by fingers/pins. However, already on the 3-4th day injured person, as a rule, began to produce present motions.

As soon as passed a threat of the development of the

inflammatory process, connected with the injury, or began to calm down the phenomena of the already developing inflammation, injured person they forced to produce the active contractions/abbreviations of muscles, under the gypsum bandage ("pulsing on the muscle contraction").

By the carefully produced active contractions/abbreviations of muscles injured person did not cause to himself harm. Metering motions to avoid a feeling of pain, it did not produce, therefore, these motions which could threaten by the propagation of infection. Forcing injured person to actively reduce muscles under the gypsum bandage, we thereby will achieve in it motions with overcoming of resistance, in consequence of which muscle they began not only to be reduced, but also to be strained, i.e., to accomplish work. These active motions of muscles in the gypsum bandage improve the conditions of the nourishment of tissues, returning them to the normal vital activity they impede the development of secondary morphological changes. Toward the end of the Great Patriotic War these measures received wide distribution, being the powerful substance of warning/prevention of resistive contractures and fibrous ankylosis of joints.

Are very important timely measures for warning/preventing the antagonistic contractures after the damage of the nerve trunks. In

those injured people who put to use detachable gypsum bandages, fixation apparatuses or orthopedic foot-wear to the full/total/complete reduction of nerve, antagonistic contractures were not observed. Finally, the effective substance of prophylaxis of contractures was the timely release of extremity from the gypsum bandage with the designation/purpose of physiotherapy and therapeutic gymnastics.

#### Treatment of contractures and ankylosis.

Within the period of the Great Patriotic War in the matter of the treatment of contractures gradually were manufactured the basic condition/positions whose use/application gave the greatest effect.

Position the first. The correcting force must be small in the value. With the correction of contracture necessary non-application of rough violence. To avoid damages one ought not to perform the correcting manipulations under narcosis and in one step The breaks of tissues, paralysis of muscles, disturbance/breakdown of blood circulation, hematomas, hemarthroses and even subluxations/semiluxations frequently complicated one-time redressment, which were being conducted under narcosis with the application/appendix of large force.

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The forced elongation of muscle frequently did serious damage to its function, causing in it the state, called pseudo-paralysis, and extremely disastrous it was reflected in the nerve conductor, giving paresis and paralyzes of the muscles of extremity.

With the one-time corrections of bending contractures were noted for the phenomena of disturbance/breakdown the blood circulation of the influx of the arterial blood as a result of the decrease of the lumen of the expanded vessels.

Especially frequently these complications were observed after the correction of the bending contractures of knee joint.

Position the second. The correcting force must act continuously. From the pathogenesis of contractures it follows that the forces, which set joint in the faulty position, are very small, but the effect/action of them is constant and long. The same must be the force, which derives/concludes joint from the faulty position.

Under the effect of the continuously acting force of tissue are dilated/extended as a result of fatigue and decrease in the threshold the excitability. In other words, any stimulation, if it acts for a

long time and is continuous, inevitably becomes below the threshold of stimulation, since the tired tissue ceases to it to react.

Thus, from two positions indicated escape/ensues the need of applying the continuous correcting force, which lies below the threshold of stimulation, increased gradually - in a drop manner, and therefore to the known limits of almost of imperceptible for the injured person.

Position the third. It is necessary to utilize all cumulative methods of the muscles, arranged/located on the side, contradictory/opposite to information. Manipulations on the correction of contracture must be combined with the massage and the therapeutic gymnastics of the muscles of this side.

During the treatment of bending contractures one must take into account the physiological preponderance of the general/common/total muscular force of the flexors above the extensors. Therefore the tendencies of the doctor in attendance must be directed not only toward the destruction of this preponderance, but also toward the achievement of inverse relationship/ratio. The reinforcement of the muscles whose function consists in the counteraction to information, had the vital importance not only during the treatment of contracture, but also for warning/preventing its relapse.

Position the fourth. It is extremely important to bring up in injured person conscious attitude to the therapeutic measures used, patience, persistence while conducting of prolonged and cumbersome treatment.

Position the fifth. Strong resistance, exerted by tissues the correcting procedures, served as reading for the simultaneous operational dissection or their elongation.

Conservative and operational measures did not replace, but they supplemented each other and composed the stages of the complex treatment of contractures and fibrous ankylosis. Operations/processes on the soft tissues, as a rule, were conducted one-time with stretching or redressment. Frequently redressment preceded operation/process, and more frequently it was realized into several stages following the operation/process on the soft tissues. Operations/processes on the bones and the joints were conducted with the resistive contractures and the fibrous ankylosis, which required the use/application of a reconstructive rearrangement of extremity.



Physiotherapy and therapeutic gymnastics played paramount role in the treatment of contractures and fibrous ankylosis. It suffices to say that, according to the data of author's development, with the treatment of contractures the therapeutic exercise was applied in 87.00/o of injured people, physiotherapy - in 67.10/o, during the treatment of fibrous ankylosis respectively - 81.10/o and 63.20/o of injured people.

The use/application of these methods with the breaks of the bones of separate segments is represented in Table 268.

From Table 268 it is evident that the use/application of therapeutic gymnastics and physiotherapy occurred on the large scales with the breaks on all segments.

Prior to the beginning of redressing procedures there were especially rationally the use/application of a paraffin therapy for the purpose of an increase in the metabolism/exchange in the tissues, softenings Rubtsov and intra-articular joints. With the great success paraffin was replaced by peat or mud/contamination. Paraffin therapy was combined with the therapeutic gymnastics.

The special importance during the treatment of contractures acquired massage and, first of all, the selective massage of separate

muscles or muscular groups for their strengthening.

The "separating" massage, which had as a goal to detach scar away from the subjects of tissues, to make it mobile/motile, is better by that feeding and, therefore, more durable to the elongation, is engaged itself the important place in the arsenal of the technical procedures of massage.

The same problems pursued therapeutic gymnastics. It, just as massage, besides the common targets of the reanimation inactive or few active tissues and organs/controls, was selective, directed toward aging/training of the weakened antagonists and thereby for the achievement of their dynamic preponderance.

The high value during the treatment of contractures acquired the mechanotherapy, which contributed to elongation and break of connective joints, to the grinding of the degenerately changed joint cartilages, to an improvement in their nourishment, and also to the reduction of the elasticity of a capsular-tendinous apparatus.

In this case were accomplished not only passive motions due to the rhythmically moving/driving therapeutic apparatus, but also active, by patients themselves; therefore mechanotherapy acted beneficially on all tissues, which participate in the formation of contracture,

including the muscles.

During the organization of ergotherapy was provided consecutive transition from the simple ones to the more complex forms of labor process, their dosage and correct selection of assignments in accordance with the character/nature of functional disturbances/breakdowns. Experiment/experience showed that ergotherapy was effective substance in the acceleration of the reduction of ability to work.

Table 268. Frequency of the use/application of therapeutic gymnastics and physiotherapy during the treatment of the bullet breaks of the bones of extremities, complicated by contracture and ankylosis (in the percentages).

(1) Вид лечения	(2) Локализация перелома и характер осложнения							
	(3) плечо		(4) предплечье		(5) бедро		(6) голень	
	кон- тран- тура	анки- лоз	кон- тран- тура	анки- лоз	кон- тран- тура	анки- лоз	кон- тран- тура	анки- лоз
(9) Лечебная гимнастика . . . . .	91,7	83,8	94,5	83,3	86,0	89,0	80,8	70,7
(10) Физпотерапия . . . . .	64,4	62,6	75,0	66,6	66,0	62,1	66,6	61,3
(11) Физические методы лечения не применялись . . . . .	5,1	12,1	1,0	—	9,0	8,5	11,1	23,5

Key: (1). Form/species of treatment. (2). Localization of break and character/nature of complication. (3). shoulder. (4). forearm. (5). thigh. (6). shin. (7). contracture. (8). ankylosis. (9). Therapeutic gymnastics. (10). Physiotherapy. (11). Physical methods of treatment were not applied.

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One of the best methods of the correction of contractures was stretching. Specifically, it made it possible to apply a small, but continuously acting force and at the same time to realize active motions in the joint. Stretching to a certain degree can be considered as permanent redressment.

As the acting force was utilized the severity of extremity itself, load, elastic thrust/rod or was applied the method of torsion.

Skeletal/skeleton and nonskeletal stretching was applied rarely. More frequently they resorted to the method of torsion which deserves considerable attention on its accessibility, simplicity and, it is doubtless, to good results during the treatment of contractures. Both with the stretching and with the method of torsion the region of joint remained open, which made it possible to simultaneously apply physiotherapy.

One-time redressment is the rough, frequently mutilating method; during the treatment of contractures it was applied rarely. Besides hamarthrosis, one-time redressment caused sometimes fatty embolism.

Together with the physiotherapy and the therapeutic gymnastics, widest use received line-of-communication redressment. On the author's development, with the contractures they composed 25.00/o, and with the fibrous ankylosis - 42.80/o of all operations/processes. In this case the contracture or ankylosis were removed gradually, into several stages. The attached position of extremity was detented with the gypsum bandage, in which the injured person walked, loading the fixed/recorded extremity. Only after a feeling of stress/voltage

in the tissues during an attempt at the motion in the gypsum bandage disappeared and pain in this case was absent, and this meant that the soft tissues were adapted to the new position of joint, they took up next readjustment. Usually for this were required 5-7 days.

The connective scars, which mechanically impede normal motions in the joint, usually were cut all over.

On the author's development, with the contractures the carving Rubtsov composed 37.50/o of all operations/processes, and with the ankylosis - 28.60/o. If after the carving of scar skin defect proved to be large and was not occluded by sutures even after the mobilization of skin, then was applied skin plastic surgery. Even with the considerable defect of the substituted by scar muscle its function suffered far not to this degree, as this could seem, on the basis of the value of scar. With the scar of soft tissues, soldered with the subject bone where there was a "third point" of fastening of muscles, which served as mechanical obstruction for the active and passive motions in the joint, the latter, on I. L. Krupko's proposition (1944), was removed operationally. Section/cut was conducted in the limits of the unchanged tissues. From the bone the scar was separated/liberated fully. In the series/number of injured people after the separation/section of scar the contracture although was decreased, it was not eliminated completely, which was connected

with the development of secondary morphological changes in the joints and the soft tissues for liquidation of which were required supplementary measures in the form of baths, therapeutic exercise, correcting manipulations.

The dissection of fascia was undertaken for eliminating the contracture, called by the pathological wrinkling of fascia. For example, with the bending contracture of knee joint intersected tractus ilio-tibialis. For the same targets served the operation/process of tenotomy and is still more frequent - the elongation of tendons. Based on materials of author's development, with the contractures it composed 25.00/o to a number of all reducing operations/processes, and with the fibrous ankylosis - 14.30/o. Tendolysis was produced in 12.50/o of injured people with the bullet break of the bones of extremities, complicated by contracture.

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With incurable paralyses after the damage of peripheral nerves were employed the operations/processes of the replacing character/nature - the transplantation of muscles. In many injured people the resistive contractures of joints, which were not yielding to the bloodless correcting procedures and operations/processes on the soft tissues, were removed by operation/process on the joints and

the bones.

Arthrotomy was conducted for the carving of intra-articular joints. The success of this operation/process in many respects depended on the thoroughness of the cessation of hemorrhage, since the formation of hemarthrosis contributed to the secondary development of joints in the joints. The decrease of hemorrhage was achieved by introduction on the eve, also, to the day of the operation/process of vitamin K, and also by the careful removal/distance of the split joints. If, in spite of preventive/warning measures, nevertheless was developed considerable hemarthrosis, then was conducted the puncture of joint.

The carving of intra-articular joints was conducted almost exclusively in the knee joint.

Resistive contractures and fibrous ankylosis in the faulty position were frequently amended by osteotomy. This operation/process with the ankylosis composed 14.30/o to a number of all reducing operations/processes. Rarely for the same target was applied arthroplasty.

With the contractures and the fibrous ankylosis, which were being accompanied by pain, was conducted the operation/process of



arthrodesis.

The frequency of the use/application of the principal of the enumerated operations/processes with the breaks of bones separate segments is given in Table 269.

As can be seen from Table 269 reducing operations/processes in the process of the treatment of the break of the bones of extremities were employed rarely.

In 1933 V. P. Filatov proposed the additional planting of tissues for the therapeutic target. Do have in this case a value the proteolytic products of the melted tissues (N. I. Krauze) or the special stimulating substances (V. P. Filatov), a question remains unresolved.

Observations showed that the additional planting of tissues under the skin of injured person exerted the therapeutic effect/action, especially with the unreleased contractures. For the additional planting they put to use the putrid conserved skin, the chemically processed skin, pericarpic shells, conserved skin of rabbit, etc.

Table 269. Frequency of the use/application of reducing operations/processes apropos of contractures and ankylosis with the bullet breaks of the bones of extremities (in the percentages).

(1) Вид операции	(2) Локализация перелома и характер осложнений							
	(3) плечо		(4) предплечье		(5) бедро		(6) голень	
	(7) кон- тран- тура	(8) анки- лоз	(7) кон- тран- тура	(8) анки- лоз	(7) кон- тран- тура	(8) анки- лоз	(7) кон- тран- тура	(8) анки- лоз
(9) Редрессация . . . . .	—	2,2	—	1,0	1,0	—	1,0	—
(10) Песечение рубцов . . . . .	1,0	1,0	1,0	—	1,0	—	—	1,0
(11) Пластика сухожилий . . . . .	—	—	1,0	—	—	—	2,0	1,0
(12) Остеотомия . . . . .	—	—	—	—	—	1,0	—	—

Key: (1). Means of operation/process. (2). Localization of break and character/nature of complication. (3). Shoulder. (4). forearm. (5). thigh. (6). shin. (7). contracture. (8). ankylosis. (9). Redressment. (10). Carving Rubtsov. (11). Plastic of tendons. (12). Osteotomy.

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Especially with acceptance in recent years obtained the additional planting of the conserved small pieces of spleen and testes of major cattle (G. Ye. Rumyantsev).

During Rubtsova's linetial contractures was applied also jacket novocaine block/module/unit according to A. V. Vishnevskiy. It was introduced by 60-80 ml 0.50% novocaine into the periphery of scar and it is direct into the scar. Novocaine solution anesthetizes and at the same time mechanically separates/liberates scar from the subjects of tissues. By this was achieved certain correction of contracture, which was being amplified by line-of-communication gypsum bandages.

As a result of the conducted treatment in the half all injured people of contracture either completely they were eliminated or considerably they were decreased (Table 270).

Table 270. Distribution of injured people with the bullet break of the bones of extremities, which were complicated by contracture, according to the results of treatment to the day of extraction (in the percentages).

(1) Результаты лечения контрактуры	(2) Локализация перелома			
	(3) плечо	(4) предплечье	(5) бедро	(6) голень
(7) Контрактура ликвидирована	22,2	29,7	17,0	28,3
(8) Степень контрактуры уменьшена . . . . .	27,8	23,9	17,0	29,3
(9) Без изменений . . . . .	50,0	46,4	66,0	42,4
(10) Итого . . .	100,0	100,0	100,0	100,0

Key: (1). Results of the treatment of contracture. (2). Localization of break. (3). shoulder. (4). forearm. (5). thigh. (6). shin. (7). Contracture is eliminated. (8). Degree of contracture is reduced. (9). Without changes. (10). Altogether.

Table 271. Distribution of injured people with the bullet break of the bones of extremities, which were complicated by contracture and ankylosis, according to the duration of hospital treatment (in the percentages).

(1) Длительность лечения в месяцах	(2) Локализация перелома и характер осложнений							
	(3) плечо		(4) предплечье		(5) бедро		(6) голень	
	(7) кон- тран- тура	(8) анки- лоз	(7) кон- тран- тура	(8) анки- лоз	(7) кон- тран- тура	(8) анки- лоз	(7) кон- тран- тура	(8) анки- лоз
(9) Два . . . . .	19,4	20,2	30,5	15,5	4,0	4,8	8,0	1,8
(10) Три-четыре . . . . .	46,6	45,4	53,3	65,7	42,0	19,2	40,4	33,9
(11) Пять и более . . . . .	34,0	34,4	16,2	18,8	54,0	76,0	45,6	62,9
(12) Итого . . . . .	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Key: (1). Duration of treatment in the months. (2). Localization of break and character/nature of complications. (3). shoulder. (4). forearm. (5). thigh. (6). shin. (7). contracture. (8). ankylosis. (9). Two. (10). Three or four. (11). Five and more. (12). Altogether.

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The contractures, which were being observed with the breaks of the bones of forearm and shin, proved to be least stable that it is explained by the physiological special features/peculiarities of these segments in connection with the function of hand and foot. To a considerable degree contributed to the reduction of motions after the breaks of the bones of shin and forearm less long-term immobilization with these breaks; most stable proved to be the contractures, which arose with the breaks of femoral bone, which is connected both with the duration of the immobilization, used with the breaks of thigh, and from the special with difficulty development of the function of

large joints. Finally, it is necessary to note that the contractures with the breaks of shoulder and thigh appeared as a result of the breaks of those penetrating into the joint more frequently than contracture with the same breaks of the bones of forearm and shin.

The duration of hospital treatment (Table 271) with the complication contracture was less, and with the complication ankylosis it was more than the average duration of treatment on the corresponding segment (see Chapter XI).

Thus, with all breaks of thigh the average duration of treatment was equal to 6.1 months; in those injured people in whom was observed the complication of contracture, it was equal to 5.2 months, and with the complication of ankylosis - 6.2 months. This is completely understandable, since contracture itself was not the reason for prolonged treatment.

Very it is characteristic that a number of contractures in the clinical issues of bullet breaks each year of war was gradually decreased; however, in last year, as a rule, was noted again an increase in their number (Chapter XI).

The specific gravity/weight of contractures among the basic clinical issues after the bullet breaks of the bones of shin during;

the separate years of the Great Patriotic War was following: in the first year - 22.20/o, the secondly - 19.80/o, into the third - 20.20/o and into the fourth - 24.90/o. The greatest percentage of contractures during the fourth year of war is explained by the fact that in connection with the termination of war the part of the injured people was discharged from hospital, without waiting until final recovery. In connection with this it is necessary to note that after extraction from the hospital greatly frequently it was observed as the decrease of the degree of contractures, so sometimes and their complete disappearance.

B. P. Cyril observed during 1-1 1/2 years 34 injured people with the break of thigh, discharged from hospital, and found that in 22 of them the motion amplitude in the knee joint on the average increased on 29° (average/mean indicator with extraction of 29°, at the moment of examination/inspection by 57°). In one injured function of joint it was reduced completely and in 11 motion amplitudes in the knee joint remained the same as with the extraction from the hospital.

Therefore it is necessary to agree with B. P. Kirillov who insisted, that the term "irreversible contracture" must not occur in the evidence about the disease/sickness/illness/malady and in the conclusions of a military-medical board, since it finally it is possible to establish/install only after prolonged observation.

A. T. Litskiy as a result of the examination/inspection of the invalids of the Great Patriotic War with the bullet break of thigh was convinced of the fact that the function of joints in the course of time gradually was improved, if with the injury it was not the straight/direct destruction of joint ends or break was not localized near from the joint.

#### THERAPEUTIC EXERCISE WITH THE BULLET BREAKS OF THE BONES OF EXTREMITIES.

Doctor of medical sciences the major of medical service A. B. Gandel'sman, the candidate of medical sciences the Lieutenant Colonel of medical service K. M. Smirnov.

In the period of the Great Patriotic War the therapeutic exercise was widely used in the system of the medical service of Soviet army. For the first time on a mass scale, correctly organized this method of treatment was applied in the hospital bases of army and front region and in the hospitals of the deep rear. Most frequently dealt by physical exercises wounded in the extremity and among other things injured people with the bullet break of long tubular bones.



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According to the data of the development of the histories of disease/sickness/illness/malady, the use/application of the therapeutic exercise with the breaks of shoulder occurred in 79.90/o of injured people, bones of forearm - 83.80/o, thighs - in 70.80/o and the bones of shin - in 71.10/o of injured people.

In the system of the complex treatment of injured people with the bullet break of the bones or extremities important role played the creation of general/common/total hygienic mode/conditions. In this mode/conditions the vital importance had the increase in the motor activity, which corresponds to the state of the organism of injured person, and also special exercises for stimulating of functional reduction and regenerative processes in the damaged extremity. The rational combination of immobilization and exercises provided not only morphological, but also functional reduction during the treatment of injured people with the break of bones. Therefore therapeutic physical culture contributed to faster recovery and was one of the basic factors, which warn the development of contractures.

The treatment of breaks by physical exercises was applied long;

before our time. Together with the massage and the thermal procedures, the motions were "folk remedy" for developing the contractures after the injuries of extremities. The need for exercises for the functional reduction after breaks had long ago been considered also in the scientific medicine.

Because of the proposed by N. I. Pirogov method of the treatment of breaks with the utilization of gypsum bandages, were created the prerequisites/premises for the authentic functional treatment. It became possible to work at the reduction of function for entire elongation/extent of treatment, but not only in its final period. Important value in this respect had the works of N. M. Volkovich, who published in 90's of the XIX century the first results of her method of the treatment of the breaks of the bones of shin. During the utilization of N. M. Volkovich's splints the injured people began to walk from the first days of treatment. This shortened the period of the subsequent functional reduction.

N. M. Volkovich's method - the rational combination of immobilization and motions should be considered progressive in comparison with the method of his contemporary of L. Championnier (L. Championniere), who at that time raised a question about the advisability of the treatment of breaks by motions and by massage without the immobilization. With the bullet ones, and consequently,

as a rule, the infected breaks this method is especially hopeless.

The works of N. M. Volkovich, G. I. Turner, V. V. Gorinevskoy and many other surgeons created the contemporary rational treatment of the breaks of the bones of extremities, which conquered solid position in Russian traumatology.

Of the afterward great October Socialist Revolution the therapeutic exercise in our country is inseparably connected with the entire system of Soviet physical culture. It is always not only therapeutic, but also educational process.

The development of the procedure of the therapeutic exercise is carried out in the number of therapeutic and scientific research institutions. Great value have the investigations, carried out in the institute of the name of Sklifosovskiy in Moscow, traumatological institute in Leningrad and Leningrad peripheral military hospital (V. V. Gorinevskaya, M. I. Kuslik, Ye. F. Dreving, V. K. Dobrovol'skiy et al.).

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In 1938-1940 and especially after war with the White Finns the procedure of exercises was refined in connection with the treatment

of bullet breaks (V. K. Dobrovol'skiy, V. A. Zotov, V. V. Gorinevskaya, V. M. Ogurtsov et al.).

At the beginning of the Great Patriotic War the available experiment/experience was generalized in the short indications and the instructions (S. F. Baronov et al., V. K. Dobrovol'skiy, V. N. Moshkov et al.). The extensive section of the therapeutic exercise was connected with the official "instructions on the methods of surgical treatment", released in 1941 by main army medical administration. All this made it possible to ensure during the Great Patriotic War organization and conducting of the therapeutic exercise in the entire hospital network/group more or less according to the common plan.

From the very beginning of the Great Patriotic War the therapeutic exercise considered as one of the necessary therapeutic methods as the necessary part of the complex treatment.

Readings to the designation/purpose of the therapeutic exercise with the bullet breaks of the bones of extremities were very wide. Different complications: the aggravation of wound infection, danger of hemorrhage, etc., they were only temporary/time contraindications. With the favorable course of treatment they only moved aside the beginning of occupations by exercises for the later periods.

During the Great Patriotic War it was distinctly explained that from the setting of the therapeutic exercise in the therapeutic institution in many respects depended the general/common/total results of entire therapeutic work. In the reports of the hospitals where was applied the therapeutic exercise, the percentage of the return to the part and the directions into the battalion of convalescents was considerably above in comparison with the hospitals where this method of treatment on the first year of the Great Patriotic War by the force of one or the other conditions yet was not applied.

Readings to the designation/purpose of the therapeutic exercise.

The effect of the therapeutic exercise depends to a considerable degree on the timely use/application of the assigned exercises. The earlier began the occupations by therapeutic gymnastics, that the results of treatment were more effective. Similar data were assembled by the series/number of researchers in the relation to different in the character/nature and the localization injuries (V. V. Gorinevskaya, A. B. Gandel'sman, D. A. Vinokurs et al.).

The same dependence is completely confirmed by data of the

author's development of the histories of the disease/sickness/illness/malady of injured people with the bullet break of long tubular bones, which flowed/occurred/lasted without the complications. With this group were not connected the injured people with the damage of vessels and nerves, with osteomyelitis, sepsis, false joint and associated diseases.

Thus, in this group remained only injured people, who do not have serious damages and close in the severity of injury. It was possible to design that the period of designation/purpose for the therapeutic gymnastics of such injured people only to the very small degree depended on the presence of different contraindications. The beginning of occupations was determined mainly by the competence of the doctors in attendance in questions of the therapeutic exercise.

It turned out that for all localizations of break the percentage of contractures or stable limitations of mobility in the joints was the higher, the more lately began the occupations (Table 272).

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In the significant part of the injured people in the absence the infections, which remained toward the end of the treatment of contracture comparatively little disturbed the volume of motions and

therefore they did not impede the return in the part. Nevertheless from these data, it is doubtless, it follows that the delay since the beginning of the use/application of exercises considerably decreased the effectiveness of treatment.

During the utilization of all possibilities which are obtained from a good organization and the correct procedure of the therapeutic exercise, it is possible to rely on the smaller percentage of contractures, than this is represented above based on materials of author's development.

Thus, for instance, M. N. Polyakov reported 37.00/o of contractures with the bullet breaks of thigh.

The later assigned the therapeutic gymnastics, that, other conditions being equal, more lately began recovery (Table 273).

These data confirm the importance of the use/application of exercises not only for warning/preventing the contractures, but also for the contraction/abbreviation of the general/common/total duration of treatment.

However, of both tables follows the need to compulsorily assign therapeutic gymnastics in the first month after injury, i.e., even

before the removal/taking of the immobilizing bandages. Should be prevented the limitation of motions in the joints instead of, mechanically dilating/extending of the already formed contracture. This was not always considered by the doctors in attendance.



**Table 272.** Frequency of the reduction of the function of joints afterward uncomplicated by the infection of the bullet breaks of the bones of extremities in connection with the period of the designation/purpose of therapeutic gymnastics (author's development, in the percentages).

(1) Локализация перелома	(2) День назначения лечебной гимнастики после ранения					(3) В среднем
	1-10	11-30	31-60	61-90	(4) 91 и более	
(5) Плечо . . . . .	55,5	54,0	44,0	32,0	25,0	42,5
(6) Предплечье . . . . .	76,0	78,0	67,0	57,0	33,0	70,0
(7) Бедро . . . . .	—	36,5	32,0	20,0	12,0	24,0
(8) Голень . . . . .	50,0	57,0	56,0	41,0	40,0	50,5

Key: (1). Localization of break. (2). Day of designation/purpose of therapeutic gymnastics after injury. (3). On the average. (4). and more. (5). Shoulder. (6). Forearm. (7). Thigh. (8). Shin.

**Table 273.** Average number of days of hospital treatment with the uncomplicated and ending by full/total/complete functional reduction bullet breaks of the bones of extremities in connection with the periods of the designation/purpose of therapeutic gymnastics (author's development).

(1) Локализация перелома	(2) Сроки назначения лечебной гимнастики после ранения (в днях)					(3) В среднем
	1-10	11-30	31-60	61-90	(4) 91 и более	
(5) Плечо . . . . .	85	80	106	114	135	102
(6) Предплечье . . . . .	70	77	80	104	168	80
(7) Бедро . . . . .		122	118	124	185	130
(8) Голень . . . . .		97	104	127	161	112

Key: (1). Localization of break. (2). Periods of designation/purpose of therapeutic gymnastics after injury (in days). (3). On the average. (4). and more. (5). Shoulder. (6). Forearm. (7). Thigh. (8). Shin.

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Larger partly the beginning of occupations was for the second and even third month, counting for the injury (Table 274).

With the timely designation/purpose of exercises in the significant part of the injured people the volume of motions proved to be restored/reduced completely even to the healing of wound, as is evident from Table 275.

One should, however, consider that, in spite of the full/total/complete reduction of the volume of motions, muscle strength of the hand of the damaged hand in the gotten better after

bullet break bones of upper extremities proved to be up to the moment/torque of extraction from the hospital frequently equal to about 50.00/o force of the undamaged/uninjured hand.

By the opportuneness of the use/application of physical exercises compulsorily is not implied very early beginning - almost during the first two or three days after injury. With the designation/purpose should be considered the course of the complications of wound infection and the special character/nature of the "mental trauma", which accompanies any injury. During any disease and damage they begin to one or the other degree of a change in the higher nervous activity. As early as 1868 I. M. Sechenov wrote: "any disease/sickness/illness/malady of body is accompanied by mental disorder in it is varied (then) forms...". These changes are especially considerable with the injuries in the combat circumstances, although they were not always realized by victim and they were not frequently considered by the doctors in attendance. Such changes affect the state of injured person, they do not pass immediately after his admission into the therapeutic institution and they are reflected in the most varied physiological functions.

Table 274. Distribution of injured people with the bullet break of the bones of extremities according to the periods of the designation/purpose of therapeutic gymnastics (author's development, in the percentages).

(1) Локализация перелома	(2) Сроки назначения лечебной гимнастики после ранения (в днях)					(3) Всего
	1-10	11-30	31-60	61-90	(4) 91 и более	
(5) Плечо . . . . .	4,5	19,5	46,5	23,5	6,0	100,0
(6) Предплечье . . . . .	10,5	36,0	43,5	7,0	3,0	100,0
(7) Бедро . . . . .	2,5	12,5	28,0	29,0	28,0	100,0
(8) Голень . . . . .	3,5	25,5	35,5	22,0	13,5	100,0

Key: (1). Localization of break. (2). Periods of designation/purpose of therapeutic gymnastics after injury (in days). (3). In all. (4). and more. (5). Shoulder. (6). Forearm. (7). Thigh. (8). Shin.

Table 275. Distribution of injured people with the bullet break of the bones of extremities according to the state of wounds up to the moment/torque of the full/total/complete reduction of the volume of motions (according to A. B. Gandel'sman's data, in the percentages).

(1) Локализация перелома	(2) Состояние раны		
	(3) гранулирует	(4) под струпом	(5) зажила рубцом
(6) Плечо и предплечье . . .	30,2	37,0	32,8
(7) Бедро и голень . . .	24,5	40,0	35,5

Key: (1). Localization of break. (2). State of wound. (3). it granulates. (4). under scab. (5). it healed by scar. (6). Shoulder

and forearm. (7). Thigh and shin.

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The general/common/total effect of trauma is connected with the suppression of the functions of central nervous system to its highest division, cerebral cortex, inclusively. Therefore it is represented by unsuitable additionally to traumatize the injured by attempts conducting of exercises immediately after injury. Practical experience completely confirms this. During the first days the therapeutic exercise proves to be at least useless. This clearly is detected in the relation to the breaks of the bones of extremities, if we compare functional issues and duration of treatment with the designation/purpose of therapeutic gymnastics into the first and subsequent decades/ten-day periods after injury. Especially early designation/purpose gives no advantage, it does not decrease the percentage of contractures with the breaks of the bones of forearm and shin and does not shorten the general/common/total duration of treatment with the breaks of shoulder and thigh. Readings for the designation/purpose of gymnastics appear somewhat later, only following the liquidation of sharp/acute post-traumatic phenomena and limitations of wound inflammatory process.

Depending on character/nature and localization of break, and

also on the special features/peculiarities of the damage of soft tissues this period of preliminary rest can be individual by very different. With the bullet breaks of thigh it is continued into the average/mean not less than 2-3 weeks, while with the breaks of another localization can be somewhat smaller. Besides the phenomena of general/common/total suppression indicated, this duration is connected also with the fact that the symptoms of local and general/common/total infection reach the greatest severity on the 10-12th day after injury (N. N. Zelanskiy).

The timely beginning of occupations with therapeutic gymnastics is compulsorily connected with the high quality and the opportuneness of all remaining therapeutic measures. Before beginning the exercises, it is necessary to conduct the surgical processing/treatment of wound, repair fractures and to reliably immobilize them in the correct position of extremity. It is necessary to also ensure the ideal quality of the immobilizing bandage.

Some questions of the mechanism of effect/action and general/common/total procedure of exercises.

It is at present necessary to critically reexamine military work experience on the therapeutic exercise in light of the data of contemporary physiology and medicine. It is necessary to say that

upon the great achievements in the organization of practical work the procedure of physical exercises in the days of the Great Patriotic War not immediately and not in everything achieved the necessary qualitative level. The series/number of positions was established/installed empirically, without the sufficient scientific substantiation, and even without the serious practical check. Vast military experiment/experience was summarized sometimes without taking into account the achievements of contemporary science. The only deserving attention attempt at the scientific generalization was conducted already at the end of the war by V. K. Dobrovol'skiy and A. N. Krestovnikov (1944). However, this work had short and very general character/nature.

Essential brake was organic-localistic approach to the understanding of the effect/action of the exercises of many workers of the therapeutic exercise. In the majority of article and textbooks, written in the pre-war and war years, completely was underestimated the value of central nervous system and the leading role of cerebral cortex in the entire activity of organism.

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Physical exercises, as any muscular activity, must be considered as the most complex reflector report/event. During the work into the

central nervous system enters the vast flow of different afferent impulses/momenta/pulses. Together with proprio- and the interoceptive signals, value which is not smaller have the exteroceptive irritants, which are joined with the motions along the mechanism of the conditioned reflex. I. P. Pavlov's teaching gives the possibility to incomparably more fully/totally/completely and more deeply understand the effect of the effect/action of exercises in comparison with the old pre-Pavlovian representations.

In the cerebral cortex occur far going processes of the adaptable rearrangements of conditioned-reflex activity for reducing the disrupted by trauma functions (E. A. Asratyan et al.). One should expect that with the systematic exercises such changes occur considerably more successful.

Effect of physical exercise on the organism of injured person more easily in all to understand from the point of view of concept about the corticovisceral pathology, developed by academician K. M. Bykov. Physical exercises as the strongest irritant, which acts on the central nervous system, can substantially change the relationships/ratios of exciter and braking processes in the cerebral cortex.

The effect of exercises, thus, is based not so much on the local



effect, as during the connected with the work conditional- and unconditioned reflex reactions in entire organism. A similar mechanism of the effect/action of exercises is shown in the number of experimental investigations on the healthy/sound people (R. P. Ol'nyanskaya, A. N. Krastovnikov, M. Ye. Marvak and E. Ya. Zak, K. M. Smirnov et al.). Action in different pathological states requires even the detailed study. However, now already are some data, which illustrate the value of the cortical regulation of functions with the therapeutic exercise.

Physical exercises and generally the mode/conditions of motor activity contribute to the reduction of the normal relations in the activity of central nervous system, disrupted with the injury. They also prevent, limit the possible negative effect of the afferent impulses/momenta/pulses, caused by the immobilization of the damaged extremity. Therefore therapeutic gymnastics makes it possible to decrease the atrophic changes and it limits, and then are removed the disturbances/breakdowns of the mobility of joints. The effect of exercises affects not only the state of the damaged extremity, but also the general state of organism, that it is possible to see from Table 276.

In accordance with the degree of the limitation of motor activity in injured people were observed different shifts/shears in

the activity of cardiovascular and respiratory/breathing system, and also in the functional state of the musculature of the undamaged/uninjured extremities.

Considering physical exercises as very complex reflector reports/events, should be special attention given the painful stimulations, which accompany the execution of the motions, maximum for the injured people on the amplitude and the force. Pains during the motions substantially are reflected in the reflector and especially conditioned-reflex activity. Their effect causes the formation of temporary/time connections/communications which can lead to the appearance of negative reactions to the appropriate irritants. Therefore one ought not to finish exercise to the perception of sharp pain. As stop signal must serve the perception of small sickness. It is very important to avoid the appearance of a pain with the exercises, fulfilled with the extraneous aid when it is especially easy to change the permissible boundary and instead of the efficiency of occupations to manufacture the faulty reactions, which additionally limit the mobility of the damaged extremity.

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It is doubtless, by very promising is the use/application of thermal procedures, and also perhaps the anesthetizing substances in

the process of occupations physical exercises. In the period of the Great Patriotic War extensively were used the exercises after the preliminary heating of the damaged section.

While conducting of therapeutic gymnastics special attention was turned to the general/common/total action of exercises, although it was considered only as the facilitating factor, peculiar "limbering-up" before the primary occupation. they began to speak of "predominantly general/common/total" and "predominantly local" action, bearing in mind that in any exercise is presently a general/common/total, and local effect (A. B. Gandel'sman).

In connection with the fact that it is not possible to itself to present only local changes, it is better to speak even not about the predominantly local, but about the predominantly special effect/action of exercises.

Not less important question - this is the activity of that occupying by the therapeutic exercise. The degree of the activity of man during the occupations depends on the character/nature of the complex totality of the conditioned-reflex irritants, which signal about the forthcoming work. The scientific study of these questions became possible because of the creation by I. P. Pavlov of the teaching about the first and second signal system.

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The activity of injured person must be considered during the solution of the number of questions of the therapeutic exercise.

Table 276. Muscle strength the state of cardiovascular system and the vital capacity of the lungs in those wounded the extremity and in healthy/sound ones (according to the observations of K. M. Smirnov).

(1) Группа исследуемых	(2) Сила мышц		(3) Состояние сердечно-сосудистой системы								(13) Жизненная ем-кост. легких (в мл)
	(6) кисти руки (в килограммах)	(7) брюшного пресса (подъем на полонение лежа в положении сидя - число раз)	(4) до нагрузки		(5) после функциональной пробы						
			(8) пульс в ми-нуту	(9) давление крови (в мм)	(10) пульс (в ми-нуту)		(11) пульсовое давление		(12) Длительность вос-становительного периода (в минутах)		
					(14) абсолют-ная циф-ра	(15) прирост (в процен-тах)	(16) абсолют-ная циф-ра	(17) прирост (в процен-тах)			
(18) Здоровые . . . . .	49	—	47	106	69	55	17	48	+30	2,3	4170
(19) Раненые ходячие с ранением ко-нечностей . . . .	41	23	51	103	61	67	31	44	+ 5	3,8	3750
(20) Раненые на по-стельном режиме с ранением ко-нечностей . . . .	35	12	61	98	59	74	21	41	+ 5	4,4	3480
(21) Раненые с огне-стрельным пере-ломом бедра (в высокой гип-совой повязке на постельном ре-жиме) . . . . .	—	—	68	106	70	77	13	34	— 5	—	3270

Note. Relatively rare pulse in those investigated in all groups should be explained the available in the period of blockade disturbances/breakdowns of nourishment. Observations are carried out on the second month after injury at a normal temperature of body.

Key: (1). Group of those investigated. (2). Muscle strength. (3). State of cardiovascular system. (4). to load. (5). after functional test/sample. (6). wrist (in kilograms). (7). abdominal press (lift from position lying/resting to position sitting - number of times).

(8). pulse per minute. (9). pressure of blood (in mm). (10). pulse (per minute). (11). pulse pressure. (12). Duration of reducing period (in minutes). (13). vital capacity of lungs (in ml). (14). maximum. (15). minimum. (16). absolute numerals. (17). growth (in percentages). (18). Healthy/sound. (19). Injured walking with injury of extremities. (20). Injured people in bed mode/conditions with injury of extremities. (21). Injured people with bullet break of thigh (in high gypsum bandage in bed mode/conditions).

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In particular, about this one should remember, applying the so-called exercises with the aid of. The insufficient activity of injured person easily converts these exercises into the passive motions, fulfilled of wncles due to the extraneous aid. Meanwhile during the treatment of the breaks of bones, especially bullet breaks, passive motions, as is known, do not usually give any positive effect. Moreover, they can instead of the use bring harm.

Further, in the practice of work on the therapeutic exercise during the Great Patriotic War was turned attention to the dissimilar volume of motions in the joints of the damaged extremity in one and the same injured person, simultaneously, depending on what motion amplitude it was desirable to achieve: to move maximum amplitude, to

reach any object/subject, etc. (M. S. Lebedinskiy, P. Ya. Halperin et al.).

Changes of the effect of exercises in the dependence on the formulation of the problem are caused by different character/nature of the corresponding voice signals, which change the functional state of cerebral cortex, and thereby also the state of entire organism.

The creation of positive conditioned-reflex shifts/shears in the organism (but thereby also the corresponding relation to the occupations) was the important problem of the educational work, conducted with the injured people. It is understandable that the consumption/production/generation of such changes composed the integral part of the general/common/total process of breeding, directed toward the reduction of fighting efficiency and ability to work. The educational actions, connected with conducting of exercises, proved to be successful only if they were harmonically connected with the entire ideological and educational work in this institution, with the state of entire therapeutic work. The particular educational measures or the systematic receptions/procedures, conducted by the workers of the therapeutic exercise, their approach to those occupying, setting by them specific problem for the injured person, the appearance of office and the like had very important value in the entire circuit of

therapeutic-educational measures. It is necessary to emphasize the important role of the ambient conditions, under which passed the occupations. In particular, serious value had the device of the office of the therapeutic exercise, its sizes/dimensions, equipment, sanitary conditions and so forth, etc. At first all this was insufficiently evaluated some chiefs of hospitals, "forgotten" to sometimes expand/develop office with the next redislocation or secreted for this target insufficient according to sizes/dimensions room. During the war of the advantage of conducting occupations in the special room, on intended for this purpose projectiles and apparatuses, became clear all, and the errors, which were being sometimes observed initially, they began to be repeated much thinner/less frequent.

The value of external effects should have been considered for the purpose of an increase in the stability of those occupying to the bad weather conditions. Reduction and increase in the hardness of injured people were provided in the process of occupations by all forms of the therapeutic exercise and had especially important value during the physical training for convalescents.

General positions of I. P. Pavlov's teaching the unity of organism and medium, about the unity of external and internal in the activity organism give possibility the problems of the therapeutic

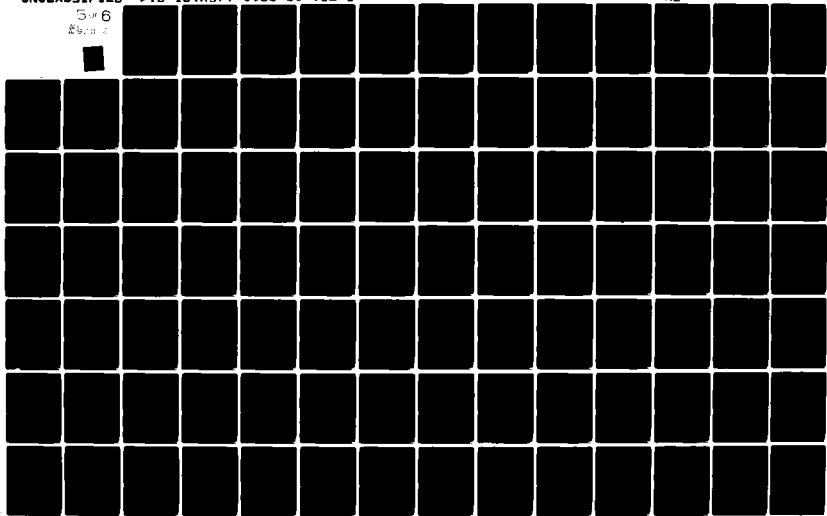


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exercise to in connection with make a conclusion about indissoluble connection/communication of the therapeutic and educational effect of physical exercises. The unity of these two sides of the therapeutic exercise provides the fast and successful reduction of the fighting efficiency of injured person.

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The instruction in different motions in the process of reduction of motor function is at the same time and the system of the therapeutic measures, which contribute with the correct procedure to the successful course of regenerative processes in the organism. The motor reports/events, carried out by injured people in the process of occupations, influence physiological processes in entire organism and among other things in the damaged extremity.

The procedure of the therapeutic exercise as pedagogical process consists of the system of the measures, directed toward the instruction of injured person in the specific motions for reducing his motor function. All these measures, if only they are selected correctly, provide simultaneously and successful therapeutic effect. While the practical conducting of exercises it is convenient to track precisely their educational-educational effect/action and to judge the effect of occupations from the dynamics of the reduction of motor

function.

The success of the conducted occupations can be taken into consideration entirely only as a result of the comprehensive estimation, which includes the determination of different indicators of motor function by measuring the motion amplitude, force, etc. It is necessary to say that this basic requirement not always and not all it was fulfilled sufficiently clearly and was not always full-valued documented by the doctors in attendance in the histories of disease/sickness/illness/malady.

During the Great Patriotic War was manufactured the conventional scheme of a similar investigation. Beginning from the second period of the treatment (see further) basic place occupied volume measurements of motions in all directions, possible for this joint. With the breaks of upper extremity added dynamometry the hands. With the breaks of lower extremity they indicated the degree of a change in the gait, lameness, need for the use of crutches or stick and so forth, etc.

The workers of gymnastics and the doctors in attendance attempted to also additionally develop efficiency with the aid of different exercises - norms. Tests on such norms had especially important value in the final, the third, the period of treatment upon

transfer to the occupations by physical training. For evaluating the functions of upper extremities as the norms applied the pulling, different hangings and detents, and also throwing into the target and to the distance. For evaluating the function of lower extremities were utilized the walking, the run and different springs. During a good organization of the therapeutic exercise similar observations in the general/common/total complex of diagnostic methods had important value.

For the investigation of motor function were applied different instruments. Volume measurement of motions was conducted usually by the goniometers, which were being prepared homemade, at the places. With a precise observance of all rules of investigation this simple procedure gave sufficiently satisfactory results for the practical work.

The measurement of muscle strength of hand by manual dynamometer was conducted employing the conventional procedure. Account to the effectiveness of exercises and estimation of the reduction of different sides of motor function conducted also with the aid of some instruments and apparatuses of therapeutic gymnastics. Their device made it possible to sometimes meter the load of the conducted exercises, in consequence of which it is possible to judge also the dynamics of the reduction of motor function. Such instruments

include, for example, the apparatuses for the rotational motions in the radiocarpal joint, equipped with dial with the divisions and so forth, etc.

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Such all investigations were conducted equally in all forms of the injuries of extremities, but not only with the bullet breaks. They acquired diagnostic value only if their results were estimated on the basis of data of comprehensive clinical observation.

Special features/peculiarities of the organization of occupations.

The organization of the therapeutic exercise was reflected in entire mode/conditions of life in the hospital. Where sufficient attention it was given to the therapeutic exercise, was created the general/common/total tendency of injured people toward the fastest and best reduction of work and the fighting efficiency. An increase in the motor activity accelerated the recovery of injured people and gave the best functional results.

Planning/gliding occupations, specialists in the therapeutic exercise proceeded from the clinical characteristic of the process of recovery, applying at each of his steps/stages only available for the

injured people exercises. However, injured person with the correct dosage always seized exercises with certain work. Consequently, exercises must as somewhat anticipate/lead the possibilities of injured person, but at the same time be for it feasible.

It is necessary to note that in the practice sometimes were observed the deviations from this rule. It was given too light and insufficiently stimulated motor an activity of injured people load or exercises were excessive difficult, impracticable, which also cooled those occupying.

To the mastery of new physical exercises one should begin only after preceding/previous not only are mastered, but also are attached, checked under varied conditions media (ward, office of therapeutic gymnastics, area/site in air and so forth).

Especially effective proved to be aging/training in those injured people, whose feeling of satisfaction by the success reached immediately overgrew into the tendency toward the new achievements. In this case the exceptional value had the frequent repetitions of exercises, without which the reduction process extremely is involved/tightened.

During a good organization of the therapeutic exercise the

designations/purposes were thoroughly individualized. This was realized also while conducting of group occupations.

Performing practical work individually with each injured person, methodologist proceeded during her planning/gliding from the overall typical diagram, which was affirmed in the practice of therapeutic gymnastics in the period of the Great Patriotic War.

Planning/gliding systematic material was distributed on this scheme for three periods:

the first period - adaptable motor rearrangements and warnings/prevention of complications during the immobilization;

the second period - reduction of the simplest components of motor function after the removal/taking of immobilization (amplitude, force, durability and motor coordination);

the third period - reduction of trained state and possession of applied military skills.

The necessary condition of the rational construction of occupations was the definition of intra-hospital classification and staffing of the groups of those occupying.

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Staffing groups for the occupations by therapeutic gymnastics was conducted not only on the periods, but also on the localization of the injuries: 1) injured people with the bullet break of the bones of upper extremities and shoulder belt/zone; 2) injured people with the bullet break of the bones of lower extremities and bones of pelvis.

This distribution facilitated the setting of the problems of treatment and the selection of physical exercises. In this case it became possible expediently to select and to arrange gymnastic equipment and special accessories.

One should emphasize that the mentioned division of injured people into the groups had singular value mainly in the first stages of treatment.

By inside each of these groups of injured people were created subgroups with the more detailed laying out on the localization of injuries (injured with the bullet break of shoulder, bones of forearm, thighs, bones of shin).



It proved to be advisable to group injured people also according to the degree of the motor activity: 1) injured people, who are moved independently; 2) injured people, who require bed mode/conditions.

Under conditions for the work of the hospital of wartime the methodologist through the therapeutic exercise usually conducted exercises with the more or less uniform in the age groups. This fact made it possible during certain schematization to give the typical positions of the procedure of the therapeutic exercise.

It is important to emphasize that the primary attention with the occupations was paid to an improvement in the general state of injured people in the process of reduction of their motor possibilities. This by directionality in the presence of the occupations was provided simultaneously warning/prevention of contractures.

Experiment/experience showed that without the sharp grouping of injured people the use/application of the therapeutic exercise did not have any considerable success.

While conducting of therapeutic gymnastics in the injured people

with the bullet break of long tubular bones was conventional the usual plan/layout of the construction of occupations. In its basic part the special exercises were made against the background of the load of the predominantly general/common/total effect/action. This background was provided by the same exercises as with any other means of injuries, in accordance with localization and severity of damage.

While conducting of hygienic gymnastics, and in the convalescents also of physical training and sport measures the procedure of occupations also remained usual, general/common/total for all categories of injured people.

Special features/peculiarities of the special exercises of therapeutic gymnastics with the bullet breaks of the bones of upper extremities.

In the first period of occupations with the injured people, especially with the break of shoulder bone, considerable attention was paid to the instruction in skills of the self-service: reaching of objects/subjects from the stand by the undamaged/uninjured hand, to dressing with the aid of one hand and i.e., and also to preparation for seat and getting up (rotations, transition from the position lying/resting on the spin to the position sitting).

At the same time, were included special exercises for the immobilized extremity: the rhythmic compression of small ball by hand, pressure against the wall of gypsum bandage during the rhythmic attempts to the motions, the rhythmic attempts to the complete motions under the gypsum bandage upon the inclusion of the damaged extremity into the complex motor report/event (imitation of climbing for rope, box, etc.), and also the diverse motions of fingers/pins.

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In this group of injured people comparatively easily it was realized transition to the exercises in the position standing and to the walking, which very facilitated transition to active motoring with the utilization of strolls in air. It proved to be advisable as to rather as possible transfer occupations into the office of the therapeutic exercise, one output/yield into which had a positive effect on injured people.

In proportion to an improvement in the general state, with the well elapsing formation of the callus was increased predominantly the general physiological load together with which was given much time also to the simple exercises under the gypsum bandage. Exercises under the gypsum then were realized in the form of attempts at the implication of the immobilized extremity into different motor

reports/events. Up to the moment/torque when there is no need in the immobilization already, these exercises must be extremely energetic. Patient must attempt as "to break" her gypsum bandage. Because of the impulse actions of sick exercise under the gypsum bandage can to a considerable degree remove negative trophic consequences the immobilization. By these exercises is disturbed the stability of conditioned-reflex connections/communications of traumatic immobilization, which give subsequently the limitation of mobility in the joints.

In the second period, after the removal/taking of gypsum bandage, as a rule, was coserved one or the other degree of difficulty of movement in the joints, which was comparatively easily removed via systematic exercises for the distention. Thus, for instance, after the removal/taking of immobilization with the break of shoulder in upper third, difficulty of movement in the elbow joint was easily removed via exercises for the distention with the aid of the undamaged/uninjured hand or with the burdening by the weight, held hand and, etc.

This it indicates the reversible, functional character/nature of such a difficulty of movement, caused in all probability only by the attachment of the conditioned-reflex reactions of inactivity, which appear in connection/communication and by trauma, also, for the

elongation/extent of the subsequent immobilization.

This position is accurate only under the condition of the application of full-valued in the technical sense gypsum dressing. But if bandage itself exerted the traumatizing effect/action (defects of technology), difficulty of movement in the joint acquired very stable character/nature as a result of the developing specific ones change in the joint. By very difficult, prolonged and requiring large perseverance on the part of the injured person by process was also the reduction of mobility in the joints, arranged/located close to the place of break (cubital - with the break in lower third of shoulder and upper third of forearm, shoulder - with the breaks in upper third of shoulder). The important factor, which maintained the phenomena of difficulty of movement, apparently should be considered in these injured people traumatic, "sympathetic" arthrosis <sup>1</sup>.

FOOTNOTE <sup>1</sup>. Under this term are understood characteristic changes - swelling, exudation, sickliness during the palpation and during the attempts to the motions and i.e., that develop in the joints with the breaks of diaphysis. ENDFOOTNOTE.

In these cases the first time after the removal/taking of gypsum bandage are contrasted the exercises for the distention, since in this case is very possible strengthening arthrosis and increase in

difficulty of movement, and hence complaint of the pains during the attempts to the motions.

In similar injured people initially were applied the carefully metered passive exercises with the aid of the undamaged/uninjured hand or with the aid of the methodologist of the therapeutic exercise: in the elbow joint to the flexure, in the shoulder to removal/diversion, etc. In this case advisable it proved to be to finish motions only to the limit where appear the perceptions of sickliness.

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Experiment/experience showed that one ought not to allow/assume the onset of sharp pains. During the disturbance/breakdown of this position was observed deterioration in the process of functional reduction. Were gradually connected exercises with the free rocking by the upper extremity where the severity of the moving segments has already certain stretching effect with the "freed" musculature. Remission/abatement of the phenomena of arthrosis more active stretching exercises in the process of the raised physical loads of the predominantly general/common/total effect/action.

During the occupations therapeutic gymnastics with the breaks of the bones of forearm it was necessary to pay special attention to the reduction of the functions of hand and fingers/pins. In these injured people was utilized the procedure of the occupations, which were being conducted with the injuries of hand, in detail developed by the series/number of the researchers (V. V. Gorinevskaya, D. A. Vinokurs, D. P. Shpakovskiy et al.).

Especially with difficulty and slowly with the breaks of bones restoring force and durability of motions, without which, however, the execution of different special motions proved to be always defective. This is why to the appropriate exercises (advisable only in the presence of proper mobility in the joints and with the restored/reduced mainly motor coordination) it is necessary to give the large place in the third period of treatment, in the battalions (separations/sections) of convalescents with the occupations by physical training. For the development of force and durability under the effects by the damaged extremity were successfully used the exercises with the ranned balls of different weight, the weights, climbing on the rope, the pole and so forth, etc.

In the final stage of occupations during the physical training in convalescents visible place it occupied grenade throwing, exercises in the receptions/procedures of hand-to-hand fighting, and in winter also ski training.

Special features/peculiarities of the special exercises of therapeutic gymnastics with the bullet breaks of the bones of lower extremities.

The first period of the use/application of the therapeutic exercise in injured people with the break of the bones of lower



extremities flowed/occurred/lasted during the sharply pronounced limitation of general/common/total mobility, which depended on the severity of traumatic process, its localization and presence of large gypsum bandage (especially high gypsum bandage with the break of thigh).

In this stage attention was paid to exercises in raising of pelvis, to the power exercises for the upper extremities (with the weights, for the distention of spring, with hitting balls, etc.). Injured people were prepared for the fastest transition to the vertical position, for which already at the position lying/resting was conducted rhythmic pressure by crutches to the armpits.

Vital importance had exercises to the force for the undamaged/uninjured lower extremity (preparation for the increased load with the standing and the walking). Were utilized exercises in resistance with the straightening and flexure in the hip, knee, talocrural joint of the undamaged/uninjured extremity. In this case the load was created by methodologist's hand, with the aid of the distention of spring, displacement/movement of ranned ball, raising of load, moved across the block/module/unit and, etc.

Experiment/experience showed that reached in this case the high degree of motor activity with the retention/preservation/maintaining

of the bed content and immobilization was the very effective for the prevention delay of chair/stool, accumulation of gases in the intestine, delay of urination and other harmful consequences of bed mode/conditions.

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Where was well set the therapeutic exercise, they approached the fastest transition of injured person to the walking on the crutches. In this case turned serious attention to the systematic inclusion into the process of the exercises of the motor apparatus of the damaged, immobilized extremity. Observations showed that without the active stimulation of the function of muscles under the gypsum bandage the latter can become the "prosthesis", in which is placed the extremity. The displacement/movement of this peculiar "prosthesis" is realized with the aid of the undamaged/uninjured foot and by motion of body. Therefore from the first days of occupations it was important to utilize exercises under the gypsum bandage, initially in the form of the rhythmic all muscle tensions of the immobilized lower extremity, then rhythmic attempts to the motions in the joints with the pressure against the walls of gypsum bandage and finally in the form of the imitation of the report/event of walking, walking on the skis/shoes, cycling, etc. Under the imitation of walking have in mind the corresponding to steps/pitches rhythmic

muscle tensions, coordinated with the motions of undamaged/uninjured lower extremities and upper extremities.

All these exercises easily are realized at the position lying/resting on the spine after careful instruction. The check of the degree of the start of the neuromuscular apparatus of the damaged extremity it proved to be convenient to produce with the feeling through the small (4x4 cm) apertures in the gypsum bandage above the arrangement of one or the other muscular groups (above the quadriceps muscle of thigh in middle third, tibial muscle of shin in upper third, etc.).

Training injured people to move at the position lying/resting extremity in the gypsum bandage, methodologists on the therapeutic exercise tracked so that in this case would be strained the muscles of the damaged extremity. Injured person they trained independently to convert/transfer from the position lying/resting to the position standing. For this injured person it was turned through the "sick" side to the stomach, was omitted to the floor/sex the undamaged/uninjured lower extremity, connecting up it that immobilized, and, leaning by hands against the cot, it got up, utilizing alternately one, and then the second crutch.

With the exercises in the position standing completely it was

included and the damaged extremity in the form of attempts to the sand bar stops, attempts to the flexure, the straightening, the removal/diversion, the reduction, the rotations towards the outside and towards the inside in the hip and knee joint. Considerable attention was paid to the walking in the gypsum bandages. In this case primary attention turned for the stimulation of the function of the neuromuscular apparatus of the damaged extremity.

It is necessary to say that there are no foundations for relying on the efficiency of the frequently applied exercises in the pressure along the axis of extremity in the presence of immobilization. If is well modeled gypsum bandage, is sufficiently strong gypsum, it is utilized metallic striving, then this pressure along the axis of extremity is not virtually attained. In the poor immobilization, the poor gypsum, the absence of stirrup this pressure along the axis can occur, but, it is understandable, to nothing good it will not lead. Exercises with the pressure along the axis must be used already later, in the second period treatments.

Release from the gypsum bandage is expedient to produce line-of-communication ("trough" or cast, then the full/total/complete removal/taking of immobilization). In this case sharply change the conditions of the activity of motor apparatus, its especially support function, and proves to be useful certain dropping of load.

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It is very important to lower during this period the load, which exerts the effect/action predominantly on the damaged extremity (L. S. Dmitriyevskaya). In those injured people, in whom immediately after the removal/taking of gypsum bandage intensely were applied special physical exercises for the distention, was observed the aggravation of joint changes and was inhibited the reduction process.

In the second period for reducing the mobility in the joints after the removal/taking of gypsum were applied the rhythmic power exercises, which exert sufficiently considerable load on the neuromuscular apparatus of the damaged extremity, and also the exercise to the weakening of musculature. Then, after the preliminary exercises of the predominantly general/common/total effect/action, was conducted distention. For the knee of bed or against the special cylinder, which is laid into the region of popliteal pit with the utilization of severity of shin, with the aid of the hands of injured person, superimposed the damaged extremity and, etc.

Subsequently were applied the "springy" motions with the utilization of weight of entire body it goes without saying after

support to the extremity became permissible and advisable. Were applied flappings. For the joints, which are located in immediate proximity to the place of break, was necessary singular care in the use/application of the stretching exercises. Thus, for instance, after the removal/taking of gypsum bandage with the break of thigh in lower third was paid attention to rhythmic stress/voltage and weakening of all muscles of thigh. It is later, together with the large general physiological load and the load on the damaged extremity, began gradual active distention (attempts to bend in the knee joint), without finishing to the pains. Subsequently of exercise they were conducted with the aid of the external force (methodologist's hand, etc.).

Pressure on the damaged extremity in the process of locomotion with different speed considerably exceeds the weight of man. Gradual attachment to this load presented frequently great difficulties. In particular with this it was necessary to consider in injured people the heavy form of the break of thigh, that observed had mode/conditions in the course of many months. Therefore with the breaks of the bones of lower extremities after the removal/taking of immobilization special importance had exercises with the gradual, metered improvement in the requirements for supporting apparatuses of the damaged extremity. Was here involved the series/number of exercises with the pressure along the axis of extremity at the

position lying/resting by methodologist's hand on the therapeutic exercise, and also pressure by extremity against the cylinder, the box, etc. It sometimes proved to be advisable to utilize the special supporting apparatuses for the walking, in the form of carriages or installations with that decreasing the weight of the injured person by counterweight or on the block/modula/unit with the counterweight.

After restoring supporting capacity of the extremity of injured person, main attention should be guided to the correction of gait.

In the final period of the use/application of therapeutic gymnastics and while conducting of the physical training for convalescents in the center of attention there was the aging/training in overcoming of different obstructions with the springs into the depth, through the obstructions, etc.

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Auxiliary apparatuses in a therapeutic gymnastics.

During the Great Patriotic War in the process of therapeutic gymnastics were used extensively different apparatuses. The creativity of many specialists in the therapeutic exercise and of the surgeons led to the creation of the series/number of very valuable

instruments for the occupations with the injured people, who convalesce after the bullet break of the bones of extremities (P. T. Goncharov, K. V. Mikhaylov, V. M. Ogurtsov, G. A. Menasyan, Z. A. Lyandres et al.).

Apparatuses proposed made it possible to increase the effect of aging/training, helping to carry out the best dosage of motions, to consider the effect of aging/training, etc. The utilization of apparatuses facilitated the problem - of interesting the injured person by exercises, which was very necessary for the full/total/complete effect of aging/training.

Together with the correct development of this question, was sometimes approached the utilization of apparatuses mechanically, being fascinated by their complex constructions/designs and converting the use/application of apparatuses in the end in itself.

These errors proceed from the Tsanderov mechanotherapy, basis of which was the information of the entire complex structure of the motions of man to the mechanical laws. The general/common/total correct direction consisted in the granting of the leading role in the instruction of injured people in doctors and methodologists, abstracting/removing to instruments only technical, auxiliary role. But if in view of design features one or another apparatus forced to



adapt the motion of injured person to his mechanical design, then this apparatus was not utilized.

The analysis of the experiment/experience of the use/application of apparatuses allowed to even during the first stage of the Great Patriotic War outline practical ways to the rational selection and their utilization in the therapeutic gymnastics. Advisable proved to be the following groups of apparatuses:

- 1) the apparatuses, which help to secrete the independent phases of motions, which support, which fix;
- 2) the apparatuses, which help to meter mechanical load;
- 3) the apparatuses, which help to consider the success of motor reduction;
- 4) the combined apparatuses (from the first three groups).

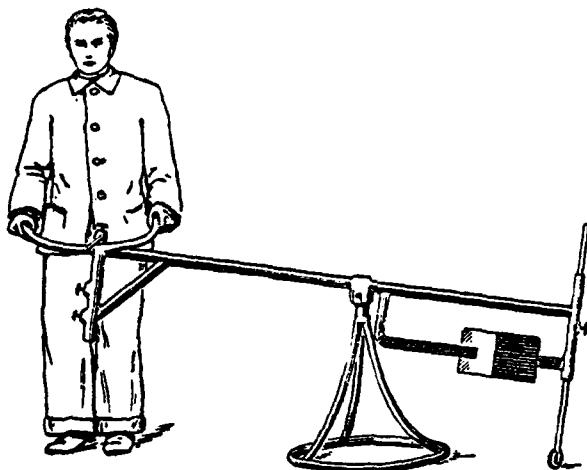


Fig. 121. Instrument for the instruction in walking with the metered load (G. A. Menasyan).

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As the example, which illustrates the first group of apparatuses, it is wide with the success of those applying in the period of the Great Patriotic War, should be given the "stairs", sorting out with fingers/pins on which, injured person produced distention in the elbow and shoulder joint. The same group of apparatuses includes the attachment for the liberation/excretion of extension in the knee joint <sup>1</sup>.

FOOTNOTE <sup>1</sup>. K. V. Nkhaylov, album of the apparatuses of therapeutic gymnastics, Narkomzdrav RSFSR, 1945. ENDFOOTNOTE.

The instrument, which helped to meter mechanical load, was the original instrument of G. A. Menasyan (Fig. . 121) and the attachment V. M. Ogurtsov (Fig. 122), where by the creation of counterweight was regulated burdening during the walking (instruments of the second group).

Are well known the instruments of the third group, which help to objectively consider the success of the reduction of motor function - goniometers of different constructions/designs, dynamometers, etc.

By an example of the apparatuses, which make it possible to combine production in the motions, dosage and account to the success of the reduction of function, is Z. A. Lyandres's, for example, instrument for production in the motion in the talocrural joint with the possibility to accurately meter pressure with the back and bottom flexure stops and to consider the value of this pressure. In the offices of therapeutic gymnastics with the large use it was used extensively also fine/small sport inventory and gymnastic equipment. Exercises on these projectiles had the very positive general/common/total effect, facilitating the liberation/excretion of motions, their dosage and the account to the effectiveness of reduction, and also helping reinforcement in the injured people of confidence in our own forces and raising their activity.

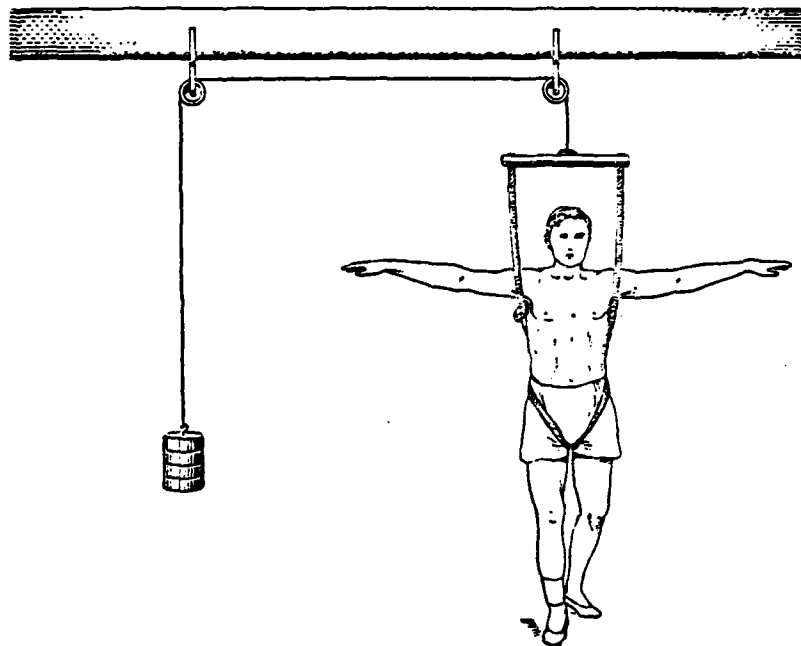


Fig. 122. A block-suspension apparatus for the instruction in walking with that reduced of the weight of body (V. M. Ogurtsov).

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The therapeutic exercise was the important composite/compound component part of the complex treatment with the bullet breaks of the bones of extremities. During the correct utilization of this therapeutic method during the Great Patriotic War it was possible to achieve the considerable successes in the reduction of health and efficiency of injured people. Essential condition was in this case the rational combination of the substances of gymnastics with other

therapeutic methods. In the first period of treatment it was important to correctly combine immobilization with the motions and with the general/common/total mode/conditions of motor activity. In the second period the primary meaning acquired the combination of exercises with physical methods and, first of all, with the thermal procedures.

During the treatment of injured people with the already formed contractures important requirement was also the utilization of exercises together with surgical and orthopedic interventions. With redressment of contracture or during the operational dissection of the confining scar the reduction of function could be successfully achieved/reached only with the subsequent energetic occupations by therapeutic gymnastics.

The necessary conditions of organization and correct application of therapeutic gymnastics was the information of the doctors in attendance in questions of the use/application of exercises.

To study by the doctors of the procedure of the therapeutic exercise as to the part of the general/common/total system of the treatment of injured people was paid serious attention during the entire Great Patriotic War.

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Chapter IX.

INCORRECTLY GROWN TOGETHER BREAKS OF THE BONES OF EXTREMITIES AFTER BULLET INJURIES.

Professor is Colonel MC I. L. Krupko.

INCORRECTLY GROWN TOGETHER BREAKS OF SHOULDER AFTER BULLET INJURIES.

According to the data of the development of the histories of disease/sickness/illness/malady, in 0.40/o of injured people with the bullet break of shoulder with the extraction from the hospital the strain was basic issue, and in 17.70/o of injured people it accompanied other basic issues. With the basic issue - the damage of nerves - the strain was observed in 12.50/o of injured people, with the contracture - in 19.50/o, with osteomyelitis - in 24.70/o, with the false joint - in 30.30/o, with the ankylosis - in 31.70/o and during the combination of poor issues the strain was noted in 38.80/o of injured people.

Consequently, the strain of shoulder most frequently accompanied

other heaviest issues.

The degree of the shortening of shoulder after bullet break, according to the data of the deepened development of the histories of disease/sickness/illness/malady, was noted in 1.20/o of injured people, and with the incorrect intergrowth of break - in 26.20/o (author's development).

Distribution according to the degree of shortening was the following: to 2 cm - 28.30/o; 3-5 cm - 62.30/o; 6-8 cm - 5.60/o; 9 cm more - 3.80/o; from entire number of strains, on the author's development, their character/nature was established/installed only in 23.50/o of injured people in the form of bias at angle.

Strain and shortening, first of all, were found in the dependence on the character/nature of break (Table 277).

Table 277. Distribution of all injured people with the full/total/complete bullet break of shoulder and separately with the shortening of shoulder (deepened development) and the strain of shoulder (author's development) according to the form/species of break (in the percentages).

(1) Группа раненных в плечо	(2) Вид перелома	(3) Оскольчатый	(4) Раздробленный	(5) Косой	(6) Поперечный	(7) Вколоченный	(8) Продольный	(9) Итого
(10) С полным переломом (кроме подвергшихся ампутации) . .		62,4	14,7	16,0	5,3	0,8	0,8	100,0
(11) С укорочением . .		54,2	16,7	20,8	4,1	4,2	—	100,0
(12) С деформацией . .		73,0	15,0	8,0	4,0	—	—	100,0

Key: (1). Group of those wounded the shoulder. (2). Form/species of break. (3). Fragmented. (4). Crushed. (5). By scythe. (6). Cross. (7). Packed in. (8). Longitudinal. (9). Altogether. (10). With full/total/complete break (besides those subjected to amputation). (11). With shortening. (12). With strain.

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Thus, in injured people, who had the shortening of shoulder, packed in breaks it was 5 times more, and the oblique and crushed breaks there was somewhat greater than in all injured people with the break of shoulder. In view of this should be considered



characteristic breaks for the shortenings - packed in, by scythe and that crushed. Analogous with this for the strains most characteristic were the fragmented and crushed breaks.

The distribution of injured people with strain and shortening of shoulder according to the level of break was dissimilar, as is evident from Table 278.

Consequently, for the injured people with the shortening of shoulder most characteristic were the breaks, which were applying to several adjacent thirds, and also breaks lower third; whereas for the injured people with the strain are most characteristic the breaks lower third.

Therapeutic immobilization was the principal substance, capable of preventing the formation of shortening and strain of shoulder. However, this did not always manage, even during the use/application of its best methods, as is evident from Table 279.

It is obvious, in the group of injured people whose treatment ended by the shortening of shoulder, was great a number with the bias of scrap, in consequence of which were here applied in a larger quantity the stretching and anechoic gypsum bandage, but to eliminate shortening completely nevertheless was unsuccessful.

Table 278. Distribution of all injured people with the full/total/complete bullet break of shoulder and separately with the shortening of shoulder (deepened development) and the strain of shoulder (author's development) according to the level of break (in the percentages).

(1) Группа раненных в плечо	(2) уровень перелома				(7) Итого
	(3) верхняя треть	(4) средняя треть	(5) нижняя треть	(6) несколько третей	
(8) С полным переломом (кроме под- вергшихся ампутации) . . . . .	33,0	38,5	23,8	4,7	100,0
(9) С укорочением . . . . .	26,4	36,0	30,1	7,5	100,0
(10) С деформацией . . . . .	30,0	33,7	36,3	—	100,0

Key: (1). Group of injured people into the shoulder. (2). Level of break. (3). upper third. (4). middle third. (5). lower third. (6). several third. (7). Altogether. (8). With full/total/complete break (besides those subjected to amputation). (9). With shortening. (10). With strain.

Table 279. Distribution of all injured people with the full/total/complete bullet break of shoulder and separately with the shortening of shoulder (deepened development) and the strain of shoulder (author's development) according to the form/species of therapeutic immobilization (in the percentages).

(1) Группа раненных в плечо	(2) Вид лечебной иммобилизации	(3) Шина	(4) Глухая гипсовая повязка	(5) Вытяжение	(6) Итого
(7)С полным переломом (кроме под- вергшихся ампутации) . . . . .		24,0	75,3	0,7	100,0
(8)С укорочением . . . . .		13,7	84,4	1,9	100,0
(9)С деформацией . . . . .		27,7	72,3	—	100,0

Key: (1). Group of those wounded the shoulder. (2). Form/species of therapeutic immobilization. (3). Splint. (4). Anechoic gypsum bandage. (5). Stretching. (6). Altogether. (7). With full/total/complete break (besides those subjected to amputation). (8). With shortening. (9). With strain.

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As far as strains are concerned, onset it is possible to place them in connection/communication with the insufficiently good immobilization (since was applied more than splints and it is less than gypsum bandages). The average period of immobilization, according to the data of author's development, was equal to 42 days, that it is necessary to consider it completely not sufficient, since the average period of consolidation with the breaks of shoulder was equal to 2.3 months.

The complication of wounds of infection, apparently contributed

to the onset of shortenings and strains of shoulder. Thus, for instance, according to the data of author's development, in the group of injured people shortening osteomyelitis met in 53.00/o, whereas in the group of all injured people with the break of shoulder it was observed in 39.30/o. Therapeutic gymnastics, physiotherapy, sequestrectomy, carving Rubtsov so forth had as a goal the treatment of bullet breaks generally. Special treatment the strains and the shortenings of shoulder did not undergo. This is understandable, if one considers that, as is known from the practice, the expressed strains and the shortenings of shoulder to 7-10 cm in the function of upper extremity noticeably were not reflected.

The unsatisfactory issues of the breaks of shoulder only in 0.40/o of injured people must be referred due to the strains and the shortenings. However, in essence strain accompanied other issues.

Incorrectly grown together breaks of the bones of forearm after the bullet injuries (see also that 15, pg. 309 and 310).

Candidate of medical sciences the Lieutenant Colonel of medical service M. I. Kuzin.

The incorrectly grown together breaks of the bones of forearm did not attract surgeons' proper attention. In the accessible literature there is not one article, which would more or less satisfactorily light pathogenesis and treatment of the incorrectly grown together bullet breaks of the bones of forearm.

One should emphasize that question this is extremely important, since the strains of forearm, according to the data of the deepened development of the histories of disease/sickness/illness/malady, were observed in 16.40/o of all recovered injured people with the break of the bones of forearm. In this case in 15.30/o of strain they were observed in combination with other issues. The incorrect coalescence of scrap frequently impaired, and sometimes completely it disturbed/detuned the function of forearm and hand, is made the injured person by invalid.

The strains of forearm with the well preserved function were encountered very rarely. The majority of injured people with the incorrectly grown together break had the disturbance/breakdown of the fine/small, highly differentiated motions of hand and fingers/pins as a result of the series/number of the disorders, which appear in tendons and nerves of the damaged forearm.

By the basic reason for the incorrect coalescence of break it is accepted to count the incorrect treatment (N. A. Golubyov, V. I. Kozhanov, A. M. Maravtsevich, M. M. Priorov). This gave the basis to a number of the authors to speak not about the incorrectly grown together breaks, but about the incorrectly joined breaks. By this is underscored the specific fraction/portion of doctor's fault in the incorrect intergrowth of break.

Among the incorrectly grown together breaks of the bones of forearm more frequent (62.40/o) were observed the breaks of the left forearm, than right one (37.60/o). These numerals reflect general law in the distribution of the bullet damages between the right and left forearm (M. N. Akhutin, L. A. Soldatchenkov, M. M. Bronstein, I. M. Nadler). The deepened development of the histories of disease/sickness/illness/malady showed that the left forearm was damaged almost 2 times more frequent (65.20/o) than right (34.80/o).

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Among the incorrectly grown together breaks of the bones of forearm in the first place stood breaks of both bones (60.40/o), then the breaks of radial bone (32.40/o) and cubital (5.20/c); in 2.00/o of injured people could not be established, what bone was damaged. Given data sharply differ from the distribution of the bullet breaks of the bones of forearm according to the form/species of the affected bone; to bullet breaks of both bones of forearm it was altogether only 18.10/o, to the breaks of radial - 42.10/o and the ulna - 39.80/o.

Thus, the bulk of incorrectly grown together breaks fall to breaks of both bones of forearm. This is explained by the fact that with break of one of the bones of forearm the second, undamaged/uninjured bone, served as if splint and impeded the bias of scrap. With breaks of both bones of condition there were completely different. Forearm was deprived of bone support. Under the effect of the thrust/rod of more strong muscles - flexors of hand - began the considerable bias of scrap, which in the absence of the proper reposition and retention of the comparable scrap led to their incorrect coalescence and expressed strain.

Among the incorrectly grown together breaks considerable place

occupied the breaks of radial bone. Radial bone is more mobile/motile than cubital. Because of this with its breaks as a result of contraction/abbreviation a pronator teres and a pronator quadratus frequently was observed the considerable bias of scrap, predominantly to the ulnar side, and their incorrect coalescence. On the level of injury the incorrectly grown together breaks were distributed unevenly (Table 280).

Consequently, among the incorrectly grown together breaks of radial bone predominated the breaks in lower third. Extremital scrap in this case, as a rule, was displaced to the side of the ulna. Interosseal gap/interval was decreased. Was disturbed the volume of motions mainly due to the pronation and the supination. Even during the well carried out reposition with this form/species of the break it was sufficiently difficultly hold down/retain scrap in the correct position as a result of the permanent thrust/rod a pronator teres and a pronator quadratus, in spite of the use/application of special pellets, which hold scrap in the correct position (A. B. Kipnis, I. M. Shelko).



Table 280. Distribution of the incorrectly grown together bullet breaks of the bones of forearm according to the level of injury (author's development, in the percentages).

(1) Локализация перелома	(2) Уровень ранения				(7) Итого
	(3) верхняя треть	(4) средняя треть	(5) нижняя треть	(6) две трети	
(8) Лучевая кость . . . . .	13,6	26,0	55,5	4,9	100,0
(9) Локтевая кость . . . . .	7,7	76,9	15,4	—	100,0
(10) Обе кости . . . . .	25,1	35,2	36,4	3,3	100,0
(11) В среднем . . . . .	20,0	33,6	42,8	3,6	100,0

Key: (1). Localization of break. (2). Level of injury. (3). upper third. (4). middle third. (5). lower third. (6). two thirds. (7). Altogether. (8). Radial bone. (9). Ulna. (10). Both bones. (11). On the average.

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Among the incorrectly grown together breaks of cubital part predominated the breaks in its middle third, and only with breaks of both bones of forearm distribution according to third occurred almost evenly, since conditions for the bias of scrap at all levels were approximately/exemplarily identical.

The fragmentation injuries were 40.40/o, bullet - 59.60/o.

Predominated the perforating injuries: among their fragmentation injuries there were 89.10/o, among the bullet ones - 97.90/o.

The form/species of break, as is known, can have the specific effect on frequency and the character/nature of the bias of scrap and, consequently, also for the frequency of the incorrectly grown together breaks. Among the incorrectly grown together bullet breaks of the bones of forearm were encountered only fragmented and crushed, the large-splintered breaks composing 63.90/o, small-splintered - 19.20/o and those crushed - 16.90/o.

Multistratal nature and connected with it exchange of one method of treatment on another could not but be reflected in the frequency of incorrectly grown together breaks. 56.40/o of injured people with the incorrectly grown together break they underwent treatment on five and more stages, which indicates certain multistratal nature. In two-three stages it was treated only by 9.20/o of injured people, in four stages - 26.00/o and on an unknown number of stages - 8.40/o of injured people.

However, it is not possible to explain all incorrectly grown together breaks only by the multistratal nature of treatment. During a good reposition of scrap and reliable immobilization with the rare exchange of bandages multi-level nature itself could not lead to an

increase in the number of incorrectly grown together breaks of the bones of forearm.

The basic reason for the incorrect coalescence of scrap should be considered the absence of reposition or the unsatisfactory, incorrectly carried out reposition. In the majority of the histories of the disease/sickness/illness/malady of indications of the produced reposition before the imposition not no gypsum bandage there is. The study of X-ray photographs convinced of the fact that the reposition in the injured people indicated, as a rule, was not conducted.

In some hospitals the reposition was conducted without any anesthesia and without the subsequent roentgenological monitoring.

B. K. Babich completely correctly underscored that some surgeons saw in the gypsum bandage the independent method of the treatment of the breaks; meanwhile gypsum bandage is only one link in the treatment of breaks. With the bias of scrap by it must precede the reposition.

Many surgeons related to the early reposition with the prejudice. Some did not produce it because they considered that the bullet breaks do not give the considerable biases of scrap as a result of the local tissue shock and the paresis of the muscles of

the damaged extremity; others - due to the phobia to cause the aggravation of infection.

The experiment/experience of the Great Patriotic War showed that the bullet breaks of the bones of forearm were accompanied by the typical biases of scrap (Table 281).

According to the data of author's development, with break of both bones of forearm predominated the biases to ulnar and dorsal side (73.0o/o); with the breaks of radial bone - also to ulnar and dorsal side (65.0o/o). Is less typical were typical biases with the breaks of the ulna. Biases along the length was observed considerably thinner/less frequent. Among incorrectly grown together fractures of both bones of forearm they were noted only in 9.2o/o of injured people, but with the incorrectly grown together breaks of their cubital and radial bone had not one injured person.

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Thus, the study of the incorrectly grown together breaks of the bones of forearm convinces of the fact that also with them was observed the more or less typical biases of scrap. The absence of large biases along the length made it possible to produce reposition without a considerable supplementary trauma and the phobia to cause

the aggravation of infection. Therefore it is not possible to disregard reposition, should be produced it thoroughly, carefully, with the use/application of local anesthesia or anesthesia/narcosis and with the necessary roentgenological monitoring before and after reposition.

Gypsum bandage must be laid only after careful reposition. Reposition without the anesthetization, without the roentgenological monitoring cannot it must remove the bias of scrap.

If are missed periods for the early reposition (first two weeks) then, as showed the experiment/experience of the Great Patriotic War, to admissibly produce for the correction of faulty position late (or secondary) reposition within the limits to 50 days after injury (V. I. Kozhanov, A. B. Kapnis, B. A. Fux).

B. A. Fux not without the bases considered that the strain of forearm is subject to correction within any periods after injury. In the studied by the author group of injured people late reposition was produced only in 4.0o/o of injured people; in 1.6o/o of injured people was applied skeletal/skeleton stretching.

That presented above makes it possible to consider that the basic reason for the incorrect coalescence of scrap with the bullet

breaks of the bones of forearm was the absence of reposition and the incorrect reposition, which was being conducted without the anesthetization and without the roentgenological monitoring.

The study of the periods of the first x-ray examination in injured people with the incorrectly grown together break of the bones of forearm showed that in 10.80/o of injured people the x-ray examination was not produced not on one of the stages of evacuation: in 89.20/o of injured people it was produced in time from one week to two and more than months, moreover in time from 1 to 7 days - in 12.80/o, from 8 to 15 days - in 13.30/o, from 16 to 30 days - in 23.60/o, from 31 to 60 days - in 25.50/o of injured people, within the periods of later than 60 days - in 14.00/o of injured people.

Consequently, during the first two weeks x-ray examination was produced only in 26.10/o of injured people. This bears out the fact that in the overwhelming majority of injured people the most critical period in the treatment of the break during which had to be conducted the reposition of scrap, was conducted incorrectly. The reposition of scrap either was not conducted completely or it was realized insufficiently.

Table 281. Characteristic of the types of the bias of scrap in injured people with the incorrectly grown together break of the bones of forearm (author's development, in the percentages).

(1) Локализация перелома	(2) Характер смещения	(3) В локтевую сторону	(4) В локтевую и дорзаль- ную сторону	(5) В дорзаль- ную сторону	(6) В ладонную сторону	(7) В разные стороны	(8) В лучевую сторону	(9) По длине	(10) Неизвестно	(11) Итого
✓ Плечевая кость . . . . .		50,0	10,0	5,0	3,8	5,0	2,5	—	23,7	100,0
✓ Лучевая кость . . . . .		—	7,7	15,4	—	7,7	23,1	—	46,1	100,0
✓ Обе кости . . . . .		24,3	26,3	22,4	0,7	1,3	—	9,2	15,8	100,0

Key: (1). Localization of break. (2). Character/nature of bias. (3). To ulnar side. (4). To ulnar and dorsal side. (5). To dorsal side. (6). In volar side. (7). To different sides. (8). To radial side. (9). Along the length. (10). It is unknown. (11). Altogether. (12). Radial bone. (13). Ulna. (14). Both bones.

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This is confirmed by the information about the stage in which is produced the first x-ray examination. In 52.5c/o of injured people it was produced in the back evacuation hospital, in 38.6o/o - in the front evacuation hospital and SEG, in 6.7o/o - in the army evacuation hospital and SEG, in 0.9c/o - in GLR and only in 1.3o/o of injured people - in PPG.

Given data even more convince of the fact that in the army region the reposition of scrap in this group of injured people either was not conducted or it was conducted insufficiently well without the x-ray examination, without taking into account the character/nature of the bias of scrap and results of reposition.

The following important link in the treatment of the bullet breaks of the bones of forearm is therapeutic immobilization, or the so-called retention of scrap. Insufficient immobilization, frequent exchange of bandages, it is doubtless, can be reflected in the frequency of the incorrectly grown together breaks of the bones of forearm.

The basic place in the treatment of the bullet breaks of the bones of forearm occupied anechoic gypsum bandage. By this method it was treated by 64.40/o of all injured people with the incorrectly grown together break of the bones of forearm, 29.20/o - by gypsum cast, 4.40/o - bridge bandage, 1.60/o - by skeletal/skeleton stretching with the subsequent immobilization by gypsum splint or by circular gypsum bandage. In 0.40/o of injured people the character/nature of immobilization was not shown.

Despite the fact that the large part of the injured people was treated by the anechoic gypsum bandage, which found widest



application in the treatment of bullet breaks during the Great Patriotic War, nevertheless in some injured people began the incorrect coalescence of scrap. Consequently, the reason for the incorrect coalescence of scrap consisted not only and not so much in the method of therapeutic immobilization, as in the absence of the proper reposition of the break, in the frequency of the exchange of gypsum bandages.

Only in 25.50/o of injured people gypsum bandage was not changed from the moment/torque of its imposition to the moment/torque of the coalescence of break. In remaining 74.50/o of injured people was conducted the exchange of bandages, including one time - in 39.50/o, 2 times - in 19.70/o, 3 times - in 11.50/o 4 or more times - in 3.80/o of injured people.

The given numerals do not make it possible to establish the direct dependence between the frequency of the incorrectly grown together breaks and the frequency of the exchange of bandages. In fact, even among the group of injured people with the incorrectly grown together break gypsum bandage was changed only one time and was changed not to time in 65.00/o of injured people, three-time- the repeated exchange of gypsum bandages was noted altogether only in 15.30/o. It should be noted that the replacement of circular gypsum bandage to the cast, which was being frequently conducted at the end

of the treatment, is also referred to the single exchange of bandages.

Among the complications with the incorrectly grown together breaks attention is drawn to the unusually high frequency of osteomyelitis (50.4o/o) and contractures (96.8o/o).

Explanation of this should be searched for, apparently furthermore in the absence of reposition. The presence of the bias of scrap contributed to the formation of blind pockets, depressions in the soft tissues and it disturbed the circulation of the blood and lymph - all this favored the development of wound infection and osteomyelitis.

The presence of osteomyelitis for a long time detained the coalescence of scrap, forced to repeated surgical interventions, lengthened the periods of the stay of injured people in the hospitals, made final functional result worse.

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The duration of the stay of injured people with the incorrectly grown together break in the hospitals was the following:

Two months were treated by 3.20/o of injured people, 3 months - 18.80/o, 4 months - 30.40/o, 5 months - 26.00/o of 6 months - 11.20/o, 7 months greater - 10.00/o of injured people; the periods of treatment were not established/installed in 0.40/o of injured people.

Given data show, then in the course of the first three months from the day of injury finished treatment only 22.00/o of injured people, 77.60/o were treated during four and more than months. On the average the treatment lasted 4 months, i.e., for 0.4 months longer than in all injured people with the break of the bones of forearm.

The incorrectly grown together breaks of the bones of forearm in the majority of injured people did not undergo the subsequent correcting treatment. In the literature also there is communications/reports about the results neither conservative nor of surgical treatment. According to the data of author's development, one-time redressment with the incorrectly grown together breaks of the bones of forearm was conducted only in 2.80/o of injured people, and that is unsuccessful.

The incorrectly grown together breaks of the bones of forearm were accompanied by the considerable disturbance/breakdown of function. The satisfactory function of hand and forearm was noted only in 3.20/o of injured people; in all remaining were noted the

limitation of the motions of fingers/pins, radiocarpal joint, elbow joint, the disorder of pronation and supination. The characteristic of the observed disturbances/breakdowns of the function of the damaged extremity is such: in 23.2o/o of injured people was noted the limitation of the motions of fingers/pins, radiocarpal, elbow joint, pronation and supination, in 34.8o/o - limitation of the motions of fingers/pins, radiocarpal joint, pronation and supination, in 20.8o/o - limitation of the motions of fingers/pins and radiocarpal joint, in 1.6o/o - disorder only of pronation and supination, in 16.4o/o - other combinations of the disorders of motions and in 3.2o/o of injured people, as has already been indicated, the limitation of motions was absent.

It must be noted that so considerable a disorder of function with the incorrectly grown together breaks of the bones of forearm partially can be explained by multiple failure of the nerve trunks of forearm, which was observed in 35.2o/o of injured people. This numeral somewhat exceeds the frequency of the damages of the nerve trunks with all bullet breaks of the bones of forearm (30.5o/o).

In all injured people with the incorrectly grown together break was observed the strain of the damaged forearm. The character/nature of strain coincides with the given above data about the character/nature of the biases of scrap. The shortening of forearm in

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the limits from 2 to 5 cm was noted in 4.40/o of injured people, the synostosis between the bones of forearm - in 2.80/o of injured people.

## INCORRECTLY GROWN TOGETHER BREAKS OF THIGH AFTER BULLET INJURIES.

Honored Scientist professor is Colonel MC M. I. Kuslik. The result of the incorrect intergrowth of thigh after his bullet break is bending and shortening of extremity. Most available criterion for determining the character/nature of intergrowth is the measurement of the length of the victim of extremity and its comparison with the healthy/sound extremity. If the small degree of bending of thigh can remain without the x-ray examination by that notd notice, then even the insignificant shortening, which unavoidably associates bending, will already focus on itself attention of both injured person and surgeon. Therefore the analysis of the shortening of extremity after the bullet breaks of thigh gives representation about the character/nature of their intergrowth.

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According to the data of the development of the histories of disease/sickness/illness/malady, the shortening of thigh is noted in 68.00/o of injured people, but in ratio 32.00/o of injured marks about the shortening in the histories of disease/sickness/illness/malady it was not.

V. G. Weinstein (war with the White Finns 1939-1940) established that the thigh after bullet break grew together itself without the shortening in 17.5-20.80/o of injured people; according to author's data, during the Great Patriotic War in the hospitals of front basis the shortening was absent in 17.20/o of injured people.

The detailed characteristic of the shortenings of extremity is represented in Table 282. In it are given the data of the deepened development of the histories of disease/sickness/illness/malady for the shortening in the relation to all breaks of thigh and separately the breaks, complicated by osteomyelitis, in order to show the effect of osteomyelitis on an increase in the shortening. Finally, in Table 282 are placed for the comparison the data of Tyuf'ye about the shortening of extremities after the bullet break of the thighs, obtained during the investigation by it of 883 injured people in the first world war.

During the comparison of the shortenings, noted in injured people in the Great Patriotic War, with the shortenings, established/installed Tyuf'ye in the first world war, is obtained large difference. Insignificant shortening to 3 cm remained in third of injured people (33.20/o) in the Great Patriotic War, and according

to the data Tyuf'ye, this small shortening were only in 4.90/o of all injured people. Large shortenings in 9 cm are more, discovered in injured people in the Great Patriotic War into 5.60/o, they were observed in the first imperialist war almost in the half injured people (44.20/o).

From the data of Table 282 it is also evident that as a result of the complication of the bullet breaks of thigh of osteomyelitis somewhat increased a number of injured people with the average shortening of thigh (4-6 cm) and is more considerable - with the large (7 cm and more); however on the average with osteomyelitis shortening was more only on 0.5 cm, than without osteomyelitis.



Table 282. Degree of the shortening of thigh after bullet break, according to the data of the deepened development of the histories of disease/sickness/illness/malady and according to the data of Tyuf'ye, obtained in the first world war (in percents).

(1) Степень укорочения (в см)	(2) Все переломы бедр	(3) Переломы, осложненные остеомиелитом	(4) Данные Тюфье
1	3,0	1,6	(5) Нет сведений
2	12,2	9,8	" "
3	18,0	14,1	" "
(6) Итого 1-3	33,2	25,5	6 4,9
4	17,9	16,8	Нет сведений
5	17,8	13,7	" "
(6) 6	14,7	16,4	" "
Итого 4-6	50,4	51,9	6 21,6
7	8,0	10,2	Нет сведений
(6) 8	2,8	4,2	" "
Итого 7-8	10,8	14,4	29,3
9 и более	5,6	8,2	44,2
(7)			
(8) Всего . . .	100,0	100,0	5 100,0
(9) В среднем . .	4,6 см	5,1 см	Нет сведений

Key: (1). Degree of shortening (in cm). (2). All breaks of thigh. (3). Breaks, complicated by osteomyelitis. (4). Data of Tyuf'ye. (5). There is no information. (6). Altogether. (7). and more. (8). In all. (9). On the average.

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Is even more graphically represented the interrelation of the shortening of thigh with the complication of osteomyelitis, and also with the sepsis in Table 283.

From the data, given in Table 283, it is possible to see that a number of complications of osteomyelitis with an increase in the degree of the shortening of thigh grew/rose more than 2 times, and by sepsis - almost 6 times.

Besides osteomyelitis and sepsis, it is possible to also note the dependence of the shortening of thigh on the greater or smaller decomposition of bone. According to the data of the deepened development of the histories of disease/sickness/illness/malady, is established/installed the following average/mean degree of the shortening of thigh with the separate forms/species of break (Table 284).

As can be seen from Table 284, according to the average data, the largest shortening developed after the crushed break of thigh, in

the second place stood small-splintered break, on the third - cross and longitudinal break, on the fourth - by scythe and that packed in, on the fifth - large-splintered.

According to the data of the deepened development of the histories of disease/sickness/illness/malady, it is possible to determine the dependence of shortenings with the bullet breaks of thigh on the character/nature of therapeutic immobilization.

From the data of Table 285 it is evident that the degree of the shortening of thigh of less anything was during the treatment skeletal/skeleton stretching; in somewhat larger degree was observed shortening during the treatment by gypsum bandage. The lack of strength of fixation in the fenestrated gypsum bandage to all is well known, and with this form/species of immobilization the shortening of thigh on 9 cm and more was observed in more than 9.00/o, injured people.

Table 283. Frequency of the complications of osteomyelitis and sepsis the injured people have with the bullet break of thigh, discharged from hospital with the different shortening (in the percentages).

(1) Осложнение	(2) Укорочение (в см)			
	1-2	3-5	6-8	9 и более
Остеомиелит (4) . . . . .	34,0	43,5	56,7	69,4
Сепсис (5) . . . . .	1,6	2,0	4,7	9,0

Key: (1). Complication. (2). Shortening (in cm). (3). and more. (4). Osteomyelitis. (5). Sepsis.

Table 284. Distribution of injured people with the bullet break of thigh according to the sizes/dimensions of shortening in the dependence on the form/species of break (in the percentages).

(1) Вид перелома	(2) Укорочение бедра (в см)					(4) Итого	(5) В среднем
	1-2	3-4	5-6	7-8	9 и более		
Поперечный (6) . . . . .	15,3	41,7	28,4	11,7	2,9	100,0	4,4
Продольный (7) . . . . .	9,1	45,4	36,4	9,1	—	100,0	4,4
Косой (8) . . . . .	19,5	40,9	27,8	8,1	3,7	100,0	4,2
Раздробленный (9) . . . . .	10,2	29,5	32,0	14,4	13,9	100,0	6,0
Крупнооскольчатый (10) . . . . .	14,8	33,3	34,9	11,4	5,6	100,0	4,1
Мелкооскольчатый (11) . . . . .	11,8	35,3	35,2	11,8	5,9	100,0	5,0
Вколоченный (12) . . . . .	18,1	41,0	31,8	9,1	—	100,0	4,2
(13) В среднем . . . . .	15,2	35,9	32,5	10,8	5,6	100,0	4,6

Key: (1). Form/species of break. (2). Shortening of thigh (in cm). (3). and more. (4). Altogether. (5). On the average. (6). Cross. (7). Longitudinal. (8). By scythe. (9). Crushed. (10). Large-splintered. (11). Small-splintered. (12). Packed in. (13). On the average.

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In spite of Soviet surgeons' large success in a reduction in the number of shortenings of extremity after the bullet break of thigh in comparison with the results, achieved/reached in this respect into the first world war, the nevertheless remaining shortenings should be recognized considerable ones.

If, together with the fight for life and retention/preservation/maintaining of the extremity of injured person, it was possible to attain in all cases of the bullet break of the thigh of the ideal standing of scrap, then, it is doubtless, success would be even large.

The effectiveness of the correction of shortenings can be illustrated by the personal observations, carried out together with D. G. Rokhlin in hospital basis of one of the fronts (Table 286).

From the hospital basis the injured people were evacuated in the gypsum bandage, and therefore the results of the correction of shortening were determined via the comparison of the standing of scrap in the X-ray photographs, produced after the admission of injured people and during their evacuation.

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Analysis Table 286 shows that in the hospital basis the full/total/complete correction was achieved/reached only in the separate injured people: it entered without shortening 17.10/o of all injured people, and were evacuated - 17.20/o.

Table 285. Shortening and form/species of therapeutic immobilization with the bullet breaks of thigh (in the percentages).

(1) Вид лечебной иммобилизации	(2) Укорочение бедра (в см)					(4) Итого	(5) В среднем
	1-2	3-4	5-6	7-8	9 и более		
Скелетное вытяжение (без гипсовой повязки) (6) . .	39,1	17,4	30,5	8,6	4,4	100,0	4,0
Скелетное вытяжение п гипсовая повязка (7) . . .	20,4	33,6	30,0	8,6	7,4	100,0	4,4
Глухая гипсовая повязка (8) . . .	13,8	36,5	33,8	11,3	4,6	100,0	4,6
Гипсовая шина (9) . . . . .	12,5	37,5	33,7	3,6	10,7	100,0	4,8
Окончатая гипсовая повязка (10) . . . . .	10,9	34,6	32,7	12,7	9,1	100,0	5,0

Key: (1). Form/species of therapeutic immobilization. (2). Shortening of thigh (in cm). (3). and more. (4). Altogether. (5). On the average. (6). Skeletal/skeleton stretching (without gypsum bandage). (7). Skeletal/skeleton stretching and gypsum bandage. (8). Anechoic gypsum bandage. (9). Gypsum splint. (10). Penetrated gypsum bandage.

Table 286. Degree of the shortening of thigh after bullet break after the admission to the hospital basis of front and during the evacuation (based on materials of the author and D. G. Rokhlin, in the percentages).

(1) Степень укорочения конечности (в см)	(2) Время наблюдения	
	(3) при поступлении	(4) при эвакуации
1	6,4	14,1
2	26,3	31,5
3	29,4	31,0
4	19,8	14,9
5	10,2	5,5
6	3,8	1,4
7	2,2	0,7
8 (5)	1,2	0,7
9 и более	0,7	0,2
(6) Итого	100,0	100,0
(7) Укорочения не было	17,1	17,2
(8) Среднее укорочение	2,7 см	2,3 см

Key: (1). Degree of the shortening of extremity (in cm). (2). Time of observation. (3). after admission. (4). during evacuation. (5). and more. (6). Altogether. (7). Shortenings was not. (8). Average/mean shortening.

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Increased a quantity of injured people with the small shortening to 3 cm due to the decrease of a quantity of shortenings of more than 4 cm and especially large shortenings - it is more than 6 cm. It is obvious that to these considerable shortenings was turned the preferred attention. Comparing average size of shortening after the admission 2.7 cm with the remaining average/mean shortening during the evacuation - 2.3 cm, results of the correction of shortening one should recognize nevertheless insufficiently effective ones, if we do not consider that the given in Table 286 numerals were obtained in



the measurement of the distance between the scrap in the X-ray photograph. Actually shortenings after correction became still less due to the liquidation in 30.00/o of injured people bending.

On the same injured people were studied the bendings of thigh along the axis. They affect the functional ability of extremity, disturbing the statics of injured person to the larger degree, rather than shortening. After the admission into the hospital basis of front the expressed bending of axis was established/installed in 23.90/o of injured people with the break of thigh. During the evacuation the bending remained in 15.60/o; therefore it was possible to consider that about third of bendings were corrected. In reality the position was different - to amend it was possible a larger quantity of bendings, but, at the same time, appeared new bendings, which is evident from Table 287.

As has already been indicated, a quantity of bendings during the evacuation of the hospital basis became to third less in comparison with admission (23.9-15.60/o), and the character/nature of bendings changed. In the correction of all forms/species of bendings was achieved/reached the considerable success, except recurvation whose specific gravity/weight was doubled: from 33.9 to 66.90/o. During the study of the reasons for so considerable an increase in the quantity of these bendings it was explained that they arose from the sagging

of thigh with the skeletal/skeleton stretching either during the translation/conversion from the latter to the gypsum bandage, or upon the exchange of the gypsum bandage, fixing elbow in the bent position, on the new, superimposed into the rectified extremity. Within the retention time on the skeletal/skeleton stretching or in the gypsum bandage was developed the bending contracture of knee joint. During the translation/conversion into the gypsum bandage they attempted to put it in the rectified position of knee joint.

Table 287. Characteristic of bendings after the bullet break of thigh after the admission to the hospital basis of front and during the evacuation (based on materials of the author and D. G. Rokhlin, in the percentages).

(1) Вершина искривления обращена	(2) Время наблюдения	
	(3) при поступлении	(4) при эвакуации
(5) Кнаружи (галифе) . . . .	32,9	19,1
(6) Вперед (сабля) . . . . .	14,2	8,3
(7) Кзади (рекурвация) . . . .	33,9	66,9
(8) Кнутри (вальгус) . . . . .	19,0	7,7
(9) Итого . . . . .	100,0	100,0

Key: (1). The apex/vertex of bending is turned. (2). Time of observation. (3). after admission. (4). during evacuation. (5). Towards the outside (jodphurs). (6). Forward (sabre). (7). Toward the rear (recurvation). (8). Towards the inside (valgus). (9). Altogether.

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The contracture of knee joint yielded to one-time rectification with the considerable work, was considerably rather inferior to attempts at the rectification of extremity even weaker, unstrengthened callus. As a result of similar manipulations was reached the alleged rectification of extremity and often not so much due to the straightening of knee joint, as due to the formation of bend in the region of break with the angle, opened toward the front (Fig. 123).

Upon transfer from the skeletal/skeleton stretching to the gypsum bandage there was necessary intermediate stage - gunny-plaster stretching, during which was developed/processed and was removed the contracture of knee joint. It was possible to also put gypsum bandage on the bent elbow, and then by line-of-communication bandages it to gradually straighten/rectify. When the treatment of break was conducted in the gypsum bandage, which fixes elbow in the bent position, then its straightening also was to realize by consecutive stages, cutting from gypsum bandage wedge on the front face of knee joint and carefully without the violence gradually it unbending. After each stage the bandage in the region of knee joint again fortified itself by several revolutions of gypsum bandage.

Strain as basic issue, according to the data of the deepened development of the histories of disease/sickness/illness/malady, composed 1.7o/o. Furthermore, with other issues it was observed in 29.0o/o of injured people. Strain the more frequently was observed in injured people, the more lately began to be applied the immobilization. S. A. Botashev (Sverdlovsk) studied from this point of view of 400 injured people with the bullet break of thigh and he revealed/detected among them 54 (13.5o/o) with the strain; on P. R. Bogdanov, strain they were observed in 12.2o/o of injured people, and

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according to A. V. Melnikov, in the therapeutic institutions of the Navy a quantity of these complications was considerably greater - 22.5o/o.

According to data of one of the hospitals (V. P. Kolosovskaya), in injured people, treated by skeletal/skeleton stretching, the strains were encountered more rarely (10.6o/o) than during the treatment by gypsum bandage (34.0o/o).

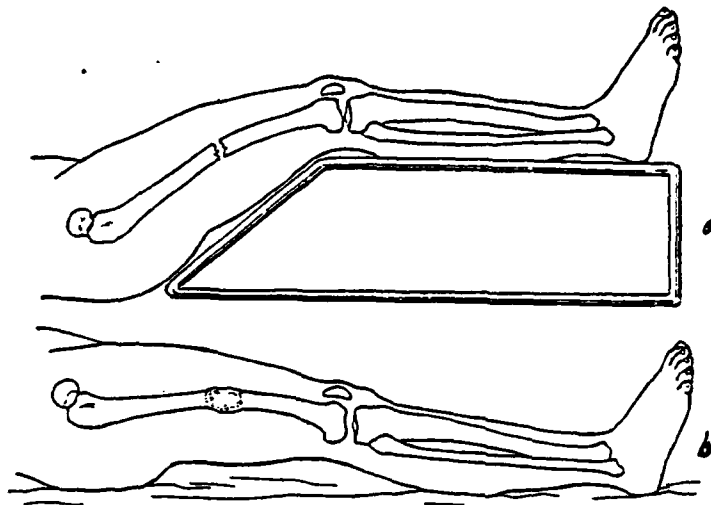


Fig. 123. Diagram of the layout of scrap of thigh during the stretching (a) and in the period of the application of gypsum dressing after the removal/taking of short-time stretching and elimination of the contracture of knee joint (b).

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A. M. Naravtsevich established that most frequently the incorrect intergrowth according to the form/species of break was obtained with the cross breaks, and on the localization - in middle third of thigh.

To the incorrect intergrowth of the breaks of thigh and to the analysis of the reasons, which facilitate this, in the Soviet

literature, especially into the second half the Great Patriotic War, was paid considerable attention (S. S. Girgolav, N. N. Priorov, V. V. Gorinevskaya, M. O. Fridland, V. D. Chaklin, A. M. Naravtsevich, F. B. Bogdanov, B. K. Babich, M. I. Kuslik et al.). All numerous statements on this theme are very similar between themselves, they sometimes mutually supplement each other and they can be brought to the series/number of indisputable positions.

First of all should be finally scattered incorrect representation about the absence of biases with the bullet breaks. This position is correct only in the relation to the first days after the injury when muscles are even in the state of local paresis. Later several days paresis is eliminated, and appears the growing on muscular hypertonia. The retraction of muscles reaches such degrees, that begins an even larger shortening of thigh, than with the closed breaks. To the bias of scrap contribute also the long elapsing processes of cicatrization in the wound.

Therefore setting of fractures with the breaks of femur it is to pay paramount attention. Setting of break not only provides the subsequent function of extremity, but simultaneously, reducing correct anatomical relationships/ratios and removing the formed pockets, it contributes to the favorable healing of wound. The correct relationship/ratio of scrap and their mutual pressure create

most favorable conditions for forming a good callus within the shortest periods. The earlier is realized setting, the easier it is reached.

One should recognize that setting of fractures frequently they retarded. The reason for this was sometimes a sanitary-tactical circumstances, which dictated the urgent need for the evacuation of the large flows of injured people. This it deprived of the possibility of the application of gypsum dressing, without which setting was unjustified, since transport splints in no way provided the retention of scrap in the correct position. Similar combat conditions justified the postponement of setting, but they forced surgeons to indicate in the documents the need for its necessary realization in the following stages. Another reason for delay with the reposition was the erroneous expectation of the liquidation of sharp/acute phenomena, collapse of edema and improvement in the general state of injured person.

This modus operandi was the consequence of the incorrect and condemned procedure of the consecutive treatment first of wound, and then already break, while the experiment/experience of the Great Patriotic War demonstrated the need for taking measures for the simultaneous treatment of wound and break, since only in this way can be achieved/reached the greatest success. As a result of the



postponement of setting not only is missed the most favorable period for its realization, but also it is not created the necessary conditions for the healing of wound.

According to the data of the deepened development of the histories of disease/sickness/illness/malady, it is not possible to establish the large dependence between shortening and period of the imposition of the therapeutic immobilization, simultaneously with which in the majority of injured people was conducted setting of fractures (Table 288).

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As can be seen from Table 288, the frequency of the use/application of therapeutic immobilization within the different periods in the groups of injured people with different degree of the shortening of extremity differed little.

Setting of break was conducted either one-time on the extracting apparatuses, or with the aid of the skeletal/skeleton stretching. Each of these methods had their medical and sanitary-tactical readings. The need for evacuation or the general heavy state of injured person they impelled to the treatment in the gypsum bandages, in view of which in these injured people was applied one-time

setting.

With the bias along the length, not removed by one-time setting, when it was possible to leave injured person in this stage and it was not contraindications from the side of general state, was applied skeletal/skeleton stretching.

One-time setting on the extracting apparatus extensively was used in the Great Patriotic War; however, its results did not always prove to be sufficient. The author analyzed the corrections of shortening with the breaks of thigh with the aid of one-time setting on the hospital basis of front. In 21.60/o of injured people no elongation of extremity achieved could not be. In remaining 78.40/o extremities it was extended to different degree, namely elongation on 1-2 cm is noted in 56.10/o, to 3-4 cm - in 18.20/o, on 5-6 cm - in 3.90/o and on 7 cm - in 0.20/o of injured people. As a result of this elongation the full/total/complete reduction of the length of injured extremity was achieved/reached in 29.10/o of injured people (in this case was simultaneously corrected bias in the width and along the axis). In remaining injured people partial elongation was achieved to a considerable degree due to the elimination of deviation along the axis, whereas biases along the length was removed partially, and in the width they remained.

Setting on the extracting apparatus reached target with the observance of the following conditions:

1. If it was conducted possibly earlier - during the first days, before the development of edema and cicatrization it is compulsory under narcosis.

2. If reposition was conducted in such a situation of extremity which provided standing of peripheral fracture of thigh with respect to axis of central. Usually with setting extremity insufficiently was abstracted/removed and insufficiently folded in the hip and knee joint. With the extensive breaking up the place of break it was to be to avoid sagging suspended on sling from the gauze.

3. Injured person must be well fixed/recorded on table and have durable dentent into perineum. Thrust/rod was established/installed for both extremities in order to preserve the correct standing of pelvis.

Table 288. Distribution of injured people with the different degree of the shortening of extremity after the bullet break of thigh according to the time of the imposition of therapeutic immobilization (in the percentages).

(1) Степень укорочения бедра (в см)	(2) Срок иммобилизации (в днях)			(4) Всего
	1-10	11-20	21 и более	
1-2	54,0	27,0	19,0	100,0
3-5	53,7	30,2	16,1	100,0
6-8	54,7	24,3	21,0	100,0
9 и более (3)	60,0	20,0	20,0	100,0

Key: (1). Degree of the shortening of thigh (in cm). (2). Period of immobilization (in days). (3). and more. (4). In all.

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4. Construction/design of extracting apparatus must be sufficient durable in order to allow/assume use/application of very considerable thrust/rod - to 32 kg., moreover application/appendix of this thrust/rod must be not for foot, but for shin, bent at right angle, or for condyle of femur.

However, after successful setting still is a very difficult problem - of holding down/retaining scrap in the correct position. Latter/last especially work was make with the multi-fragmented break with the considerable range of the breaking up of the bone when it

was impossible to create the mutually-tatent of basic scrap. The experiment/experience of the Great Patriotic War showed that in the gypsum bandage frequently began the secondary bias of scrap, which depended on the insufficient modelling of gypsum bandage in the absence of the necessary angles of flexure in the knee and hip joint.

Subsequently the reason for secondary biases was the frequent repeated exchange of gypsum bandage. data of the deepened development of the histories of disease/sickness/illness/malady confirm the presence of the interrelation between the frequency of the exchange of bandage and the degree of the shortening of thigh.

Consequently, if there was a considerable shortening of thigh, gypsum bandage was changed more frequently than with the small shortening.

Insufficient and incorrect roentgenological monitoring of the standing of scrap deprived of the possibility to in proper time reveal/detect and to eliminate their secondary bias. Thus, in separate injured people were limited to production X-ray photographs in one projection, due to what remained unnoticed the setting of the ends of the scrap for each other in the second projection. Roentgenological control after setting should be produced through the gypsum bandage, since biases can begin during its imposition. As a

result of the insufficient roentgenological monitoring they retarded with the secondary reposition or with the translation/conversion into the skeletal/skeleton stretching.

Finally, was observed late biases from the premature load of extremity without the gypsum bandage. After the bullet breaks of thigh in many injured people the formation of the callus and its rearrangement were continued long time, frequently considerably exceeding the usual periods of the intergrowth of the break of thigh. Therefore the periods of the removal/taking gypsum bandage had to be determined individual on the basis of clinical and roentgenological data. Depending on the same data had to be regulated the degree of the load of the victim of the extremity: walking on two crutches, on one or with the bacillus/rod.

Table 289. Distribution of injured people with the different degree of the shortening of thigh after bullet break according to a number of exchanges of gypsum bandage (in the percentages).

(1) Укорочение бедра (в см)	(2) Число смен гипсовой повязки	(3) Одна	(4) Две	(5) Три	(6) Четыре и более	(7) Повязка не менялась	(8) Гипсовая повязка не применялась	(9) Всего
1—2		31,5	6,0	4,0	—	50,0	8,5	100,0
3—5		29,3	14,6	4,9	3,1	41,0	7,1	100,0
6—8		30,6	20,2	8,2	3,3	30,6	7,1	100,0
9 и более (10)		17,7	17,7	15,5	15,5	22,2	11,4	100,0

Key: (1). Shortening of thigh (in cm). (2). Number of exchanges of gypsum bandage. (3). One. (4). Two. (5). Three. (6). Four and more. (7). Bandage was not changed. (8). Gypsum bandage was not applied. (9). In all. (10). and more.

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It should be noted that were little used the fixation apparatuses, on one hand, which insure the place of break and, on the other hand, which allow/assume the development of motions in the knee joint. On the early load without the fixation apparatus testify observed refracture.

Very vital importance in the incorrect intergrowth of breaks had the insufficiently frequent use/application of skeletal/skeleton

stretching and some defects, allowed while its conducting.

The data of the deepened development of the histories of disease/sickness/illness/malady about the use/application of skeletal/skeleton stretching are presented in the volume of 15 present works (pg. 429-450); here are given only some data about the shortening of thigh depending on the character/nature of the applied therapeutic immobilization. If we compare the average/mean degree of shortening in the relation to all breaks of thigh (4.6 cm) with the degree of shortening after treatment by skeletal/skeleton stretching (4 cm), then this difference is only 0.6 cm; however the specific gravity/weight of skeletal/skeleton stretching among other methods of immobilization in the group of injured people from small ones by the shortening of thigh (1-2 cm) is 2-3 times more than in injured people with the large shortening (Table 290).

A. M. Bruk on the basis of the study of the breaks of thigh in 1491 injured people and M. S. Znamenskiy in 432 injured people very clearly showed the advantage of skeletal/skeleton stretching over the gypsum bandage (Table 291).



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Table 290. Distribution of injured people with the bullet break of thigh with the different degree of shortening according to the form/species of therapeutic immobilization (in the percentages).

(1) Укорочение бедра (в см)	(2) Вид иммобилизации	(3) Глухая гипсовая повязка	(4) Скелетное вытяжение	(5) Гипсовая повязка и вытяжение	(6) Прочие виды иммобилизации	(7) Всего
1—2		67,2	2,9	24,7	5,2	100,0
3—5		77,0	0,8	18,4	3,8	100,0
6—8		79,0	1,0	16,4	3,6	100,0
9 и более (8)		65,7	0,9	27,0	6,4	100,0

Key: (1). Shortening of thigh (in cm). (2). Form/species of immobilization. (3). Anechoic gypsum bandage. (4). Skeletal/skeleton stretching. (5). Gypsum bandage and stretching. (6). Other forms/species of immobilization. (7). In all. (8). and more.

Table 291. Shortening of thigh after the bullet break in the dependence on the method of immobilization (according to the data of A. M. Bruk and M. S. Znamenskiy, in the percentages).

(1) Укорочение бедра (в см)	(2) Скелетное вытяжение		(3) Гипсовая повязка	
	(4) по данным А. М. Брука	(5) по данным М. С. Знаменского	(4) по данным А. М. Брука	(5) по данным М. С. Знаменского
0—2	58,0	63,6	32,0	29,3
3—4	34,0	25,8	49,0	50,0
5 и более (6)	8,0	10,6	19,0	21,7
(7) Итого . .	100,0	100,0	100,0	100,0

Key: (1). Shortening of thigh (in cm). (2). Skeletal/skeleton stretching. (3). Gypsum bandage. (4). according to A. M. Bruk's data.

(5). according to M. S. Znamenskiy's data. (6). and more. (7).  
Altogether.

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Skeletal/skeleton stretching was applied, according to the observations of authors' majority, only within limits of 10.0-20.0o/o of all breaks of thigh, what, of course, is insufficient. Furthermore, were observed defects while conducting of this stretching which were reduced in essence to the use/application of insufficient loads, short duration of stretching and the incomplete utilization of lateral thrust.

In spite of the existed opinion about the peculiarity of biases with the bullet breaks it is necessary to recognize that also here it was possible to note the specific law. With the breaks in upper third of thigh incorrect intergrowth was characterized by the bias of upper break by the thrust/rod of buttock muscles and by an iliac-lumbar towards the outside and toward the front, extremital scrap was displaced by the thrust/rod of the bringing muscles down and towards the inside. With the breaks in middle third of thigh proximal scrap was displaced towards the outside and frequently toward the front, and extremital scrap pulled upwards, toward the rear and towards the outside. With the breaks in lower third of thigh was observed usually

the bias of extremital break by the thrust/rod of gastrocnemius muscles, upwards and toward the rear, the end of proximal break was displaced forward.

According to the data of the deepened development of the histories of disease/sickness/illness/malady, it is established/installed, that the most favorable results in the relation to the shortening of thigh were obtained with the bullet breaks lower and middle third.

As can be seen from Table 292, the worst conditions for the production of setting and retention of scrap of thigh with the bullet breaks occurred in upper third.

Form and sizes/dimensions of the callus to a considerable degree depended on the character/nature of the bias of scrap. It is regular, that on inside of bending where occurs large load, was always observed in the X-ray photographs more powerful/thicker and more sclerosed corn.

The correction of the incorrectly grown together breaks within the late periods, but before the final formation of the callus was realized by a use/application of skeletal/skeleton stretching by large loads - sometimes to 25 kg. Are described the successful

results of the correction of the incorrect standing of scrap on the 2nd and even on the 3rd month after injury.

S. A. Botashev succeeded in amending the strain of extremity, applying stretching during the periods up to 2 months. D. S. Kovalev and I. M. Florianovich in order to remove shortening, intentionally resorted to the gap of young callus, applying for this purpose load to 18 kg. They applied successfully late skeletal/skeleton stretching with the begun consolidation of the break of thigh with the bias 30-40 days after injury in 4 injured people, after 40-50 days - in 2, after 50-60 days - in 3 and after 80-85 days - in 3 injured people. The moment/torque of the gap of the callus was always accompanied by the special perception of injured people, by the rectification of the damaged extremity and by the disappearance of shortening.

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Table 292. Distribution of injured people with the bullet break of thigh at the different level according to the degree of shortening (in the percentages).

(1) Уровень перелома бедра по третям	(2) Укорочение бедра (в см) (2a)				(3) Итого
	1-2	3-5	6-8	9 и более	
Верхняя треть . . . . .	14,6	48,8	28,5	8,1	100,0
Средняя треть . . . . .	14,8	55,0	25,3	4,9	100,0
Нижняя треть . . . . .	18,3	57,2	20,5	4,0	100,0

Key: (1). Level of the break of thigh on third. (2). Shortening of thigh (in cm). (2a). and more. (3). In all. (4). Upper third. (5). Middle third. (6). Lower third.

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In the majority of injured people the gap of the callus ensued on the 2-5th day after stretching by large load. The period of consolidation was determined by 2-3 months from the moment/torque of the forcible gap of corn.

In the presence of the completed consolidation the correction of the incorrectly grown together break was conducted via osteotomy, sometimes with the supplementary osteosynthesis. To this operation/process they resorted only in those injured people who themselves insisted on the correction of strain, since many injured

people during the considerably expressed strain in the course of time were adapted, and strain little was reflected in the functional ability of extremity.

Consequently, reading to the operation/process must be not so much form and degree of bending, as functional disturbances/breakdowns and subjective perceptions, which most frequently was observed with heavy recurvation and torsion bias.

On the basis of represented data of the deepened development of the histories of disease/sickness/illness/malady it is possible to draw the conclusion that the shortening of the thigh with which the injured person was discharged from hospital, was found in the dependence not only on the special features/peculiarities of break itself and associating it complications, but also on the character/nature of treatment.

INCORRECTLY GROWN TOGETHER BREAKS OF THE BONES OF SHIN AFTER BULLET INJURIES.

V. D. Kuperman.

The anatomical structure of shin is such, what with the break of one bone another is to the known degree the natural splint, which warns the bias of scrap.

The strain of the bones of shin was the consequence of bullet break, but it was not necessary. Heavy bendings of the bones of shin frequently were observed as the issue of the bullet infected break. In the formation of strains considerable role they played: the absence of the correct treatment of the bullet breaks of the bones of shin, insufficient reposition or full/total/complete absence of the reposition of scrap and late therapeutic immobilization.

If in the pre-war period a question about the reposition of scrap within the late periods with the open breaks of bones was permitted negatively due to a phobia of the aggravation of infection, then in the period of the Great Patriotic War it was established/installed, that the reposition of scrap it was possible to produce, also, within the late periods, after 3-4 weeks after

injury even later. The reposition of scrap had very high value not only for the subsequent coalescence of the break in the anatomically correct position, but also for the successful fight with the sharp/acute suppuration.

According to the data of the deepened development of the histories of disease/sickness/illness/malady, the incorrect coalescence of the bones of shin after bullet break was observed in 17.0o/o of discharged injured people, moreover in 0.6o/o of this number, besides the incorrect coalescence, other no pathological changes with the extraction from the hospital it was noted, but in remaining (16.4o/o) strain on the spot of break accompanied other more serious consequences of bullet breaks. The frequency of the incorrect coalescence of the separate bones of shin was the following: the tibia - 14.1o/o, fibular bone - 4.6o/o, and with break of both bones - 45.6o/o.

Strain accompanied the most diverse issues of the bullet breaks of the bones of shin (Table 293), including the "good results" (in 1.7o/o), when it did not disturb the function of extremity.

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Most frequently strain was observed with the compound fractures, when



it was the composite/compound component part of combined issues (37.30/o), somewhat thinner/less frequent - with the ankylosis, osteomyelitis and contractures (29.9-22.70/o).

These relationships/ratios, which concern all bones of shin, together undertaken, it is possible to trace, also, on the separate bones, only with the breaks of fibular bone most frequently the strain accompanied ankylosis, but not the combination of different issues.

All data, given below, are acquired based on materials of author's development.

The bias of bone fragments in the width was in 8.60/o of injured people, along the length - in 10.90/o, at angle - in 17.80/o, the combined bias - in 28.60/o, the form/species of bias was not refined in 34.10/o.

Of the age groups the injured people were distributed as follows: of up to 20 years - 7.10/o, 21-30 years - 38.00/o, 31-40 years - 40.70/o, 41-50 years - 14.20/o of injured people.

As can be seen from represented data, the greatest percentage of injured people with the incorrectly grown together break of the bones

of shin fell to the age from 21 year to 40 years, which is completely explained by the age composition of the draft contingents of the troops. To the right shin from the incorrectly grown together breaks it was necessary to 47.90/o, to the left - 51.40/o and to both shins - 0.70/o.

Among the incorrectly grown together breaks of the bones of shin predominated fragmented breaks (91.00/o), whereas the generally fragmented breaks of the bones of shin were encountered in 65.40/o of injured people. Consequently, the severity of bullet breaks was one of the etiological factors of the onset of incorrect coalescence.

From the incorrectly grown together breaks of the bones of shin 53.00/o there were after bullet injuries and 47.00/o - afterward fragmentation, 78.60/o - as a result of through ones and 21.40/o - as a result of blind-end injuries, which corresponds to the general/common/total distribution of injured people with the bullet break of the bones of shin.

A great quantity of bullet breaks of the bones of shins which led to the incorrect coalescence, was in middle and lower third of shin, and also on the boundary between them (Table 294).

This distribution corresponded to the general/common/total

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distribution of the breaks of the bones of shin according to third.  
Furthermore, it finds explanation, also, in the  
anatomical-topographical relations to this region.

Table 293. Frequency of the detection of strain in the place of break with different basic clinical issues of the bullet breaks of the bones of shin (in the percentages).

(1) Локализация перелома	(2) Основной клинический исход						
	(3) Хороший	(4) Повреждение нервов	(5) Контрактура	(6) Анкилоз	(7) Остеомиелит	(8) Комбинация разных исходов	(9) В среднем
(10) Большеберцовая кость . . . . .	1,9	12,6	17,9	22,7	23,1	32,6	14,1
(11) Малоберцовая кость . . . . .	0,7	4,4	5,2	19,2	15,0	7,0	4,6
(12) Обе кости голени . . . . .	1,2	35,3	53,2	51,1	50,2	59,0	45,6
(13) В среднем . . . . .	1,7	11,9	22,7	29,9	29,0	37,3	17,0

Key: (1). Localization of break. (2). Basic clinical issue. (3). Good. (4). Damage of nerves. (5). Contracture. (6). Ankylosis. (7). Osteomyelitis. (8). Combination of different issues. (9). On the average. (10). Tibia. (11). Fibular bone. (12). Both bones of shin. (13). On the average.

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Bones in middle and lower third are thinner, are arranged/located superficially and have very small layer of soft tissues. A front-medial part of the tibia was located under the worse conditions of consolidation, since it was covered only with skin, and the nourishment of bone was lowered/reduced in connection with the insufficiently developed blood circulation of this division of

extremity. With the injury was disturbed the integrity of vessels and periosteum, and because of this the processes of regeneration passed badly/poorly. Formed with the break of the bones of shin hematomas, included in the intractable fascial covers, did not give the possibility to develop to collateral blood circulation. The conditions of blood circulation in the shin with the injuries proved to be much worse, than in the thigh.

In the studied contingent of injured people with the incorrect intergrowth of bone scrap the injuries were extensive and in majority their were accompanied by break of both bones the shins (4 times more frequently than one bone), which led to the considerable bias of these scrap. In the group of injured people with the incorrect coalescence of break was observed the injury of large vessels in 8.40/o of injured people, the damage of nerves - in 11.40/o, the damage of joints - in 6.40/o. During the comparison of these indicators with the data, which relate to all breaks of the bones of shin, it should be noted that in the present group (with the incorrect coalescence) the injury of vessels and nerves was noted almost 2 times thinner/less frequent, and joints were damaged somewhat more frequent.

In the first twenty-four hours on DMP it was delivered to 50.00/o of all injured people. In KhPPG during the first three days

entered 35.80/o.

On BMP and PMP the immobilization of the damaged extremity was carried out in 23.60/o of injured people with the aid of the splints of Cramer, plywood, home-made. On DMP the immobilization with the aid of the splints was carried out in 66.40/o, rarely were laid detachable gypsum bandages. In KhPPG is produced the immobilization of the damaged extremity in 10.00/o of injured people.

Thus, about one quarter of all injured people with the incorrectly grown together break of the bones of shin obtained transport immobilization in proper time on BMP and PMP, whereas in remaining injured people the immobilization was applied later, that it could not but influence further issues of treatment.

Dissection and carving of wounds with the simultaneous removal/distance of bone and metallic fragments were produced on DMP in 72.90/o of injured people. In 5.00/o was produced the dressing of large vessels with the simultaneous blood transfusion.

Table 294. Strain distribution after the bullet breaks of the bones of shin according to the level of break (in the percentages).

(1) Число сломанных костей	(2) Уров нь перелома на протяжении трети			(6) Всего
	(3) верхней	(4) средней	(5) нижней	
(7) Одна . . . . .	4,3	12,9	2,1	19,3
(8) Обе . . . . .	15,0	31,4	34,3	80,7
(9) Всего . . . . .	19,3	44,3	36,4	100,0

Key: (1). Number of broken bones. (2). Level of break for elongation/extent third. (3). upper. (4). average/mean. (5). lower. (6). In all. (7). One. (8). Both. (9). In all.

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In KhPPG 27.60/o of injured people was superimposed circular gypsum bandage, 25.50/o - posterior gypsum cast, 46.90/o - splint. Thus, splints were applied in KhPPG more frequently than other forms/species of immobilization. The dissection of wounds is produced in 35.70/o, the bloodless reposition of bone scrap - in 0.70/o. Anaerobic infection in KhPPG is noted in 5.00/o, suppurative - in 52.10/o of injured people.

In the evacuation hospitals of rear gypsum circular bandage was applied in 62.30/o of injured people, gypsum cast - in 22.90/o, splints - in 12.00/o, the stretching in the form of gunny-plaster,

skeletal/skeleton and with the aid of the lady's mantle was applied in 2.80/o. To 30 days gypsum bandage was superimposed in 40.80/o of injured people, during 30-60 days - in 50.60/o, more than 60 days - in 8.60/o. In connection with the suppurative flows and from other readings gypsum bandage in the majority of injured people was changed frequently. The bloodless reposition of bone scrap was produced only in 7.10/o.

Entire osteomyelitis it was observed in 74.30/o of injured people; in 72.40/o was noted osteomyelitis with the presence of sequestrations; however, sequestrectomy was applied in all in 48.60/o (among other things repeated sequestrectomy in 10.70/o). The removal/distance of fragments and the dissection of wounds were produced in 22.30/o of injured people.

Were applied the conservative forms/species of the treatment: mud cure, peat treatment, therapeutic gymnastics and physiotherapy in the form of irradiation by sun-lamp and quartz lamp.

X-ray examination in KhPPG was produced in 0.70/o of injured people, in the evacuation hospital - in 94.30/o of injured people, in no way was conducted x-ray examination in 5.00/o. From the moment/torque of injury the fluoroscopy or X-ray analysis during the first 7 days was made in 8.20/o of injured people, to 14 days - in



14.2o/o, to 3 weeks - in 6.8o/o, more than 3 weeks - in 18.0o/o and more than one month - in 52.8o/o. Roentgenological monitoring one time was performed in 30.0o/o of injured people, 2 times - in 20.0o/o and in no way it was conducted in 50.0o/o.

Roentgenologically and clinically the consolidation of the break during the first 30 days after injury was noted in 2.8o/o of injured people, from 30 to 90 days - in 32.1o/o, from 90 to 120 days - in 18.2o/o, from 120 to 150 days - in 11.5o/o and more than 150 days - in 12.1o/o, the period of consolidation was unknown in 23.3o/o.

With the extraction from the hospital in 20.4o/o of injured people was recorded the shortening of extremity. From this number in 55.2o/o degree of shortening extremity are not shown. The distribution of injured people according to the degree of the shortening of extremity was following: 1-2 cm - in 25.4o/o, 3 cm - in 24.0o/o, 4 cm - in 20.5o/o, 5 cm - in 12.7o/o, 6 cm - in 11.2o/o, 7 cm - in 4.7o/o and 8 cm - in 1.5o/o of injured people.

Limitation of motions and difficulty of movement in the talocrural and by elbow joint were observed with the extraction in 77.1o/o of injured people.

Ankylosis was noted in 5.7o/o of injured people; the unhealing

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suppurative fistulas proved to be in 34.10/o; trophic ulcers with the extraction remained in 7.10/o of injured people; neuritides were in 11.40/o; contracture in the form of horse foot was observed in 18.50/o of injured people.

Thus, the incorrectly grown together breaks of the bones of shin were for the most part the consequence of the severity of breaks. Sometimes the incorrectly grown together breaks of the bones of shin could be connected with the insufficient transport immobilization or the insufficiently full/total/complete primary surgical processing, the rare use/application of stretching and reposition of scrap with the subsequent roentgenological it with monitoring. Strain as the basic issue of the bullet breaks of the bones of shin was observed in all in 0.60/o of all discharged injured people with the break of the bones of shin.

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## Chapter X.

### AMPUTATIONS WITH THE BULLET BREAKS OF THE BONES OF EXTREMITIES.

Professor is the Lieutenant Colonel of medical service P. A. Kopylov.

By amputations it is accepted to call surgical interventions, which consist in the removal of extremity for the elongation/extent of one or the other bone (or bones), i.e., between the joints. Truncations at the level of joints themselves are defined as ramifications or exarticulations. The original definition of these ancient determinations recently was lost. The first reason served the wide acceptance of interventions, called re-amputations.

Under this name frequently are united the operations/processes of two kinds. First of all, reconstructive interventions, fulfilled for the purpose of prosthetics and which consist in the removal of the extremital part of the stump together with the end of the bone

(or bones). In connection with the development of prosthetics after war 1914-1918 these interventions began to be conducted very frequently.

In the second place, re-amputations are called also the repeated amputations, produced, when the made earlier amputation did not achieve target. As an example can serve the injured people in whom after the removal of extremity apropos of anaerobic infection the latter continued to progress and for the rescuing of life it was necessary to make the second amputation of the same extremity at the higher level.

By many authors of amputation and re-amputation they are not demarcated with the proper definition. Besides togas, the term "re-amputation" is applied in its double value.

Hence the possibility of difficulties and errors during the comparison of data and conclusions of different authors. Thus, for instance, lethality after re-amputations, produced for the purpose of prosthetics, is in effect equal to zero; after repeated amputations on the clear reasons the lethality is considerably higher than after usual amputations. Association of these two different interventions by the name "re-amputation" gives some indicator of lethality which can only disorient. The same is obtained also during the association

of re-amputations in any understanding of this term with the amputations.

In the following presentation the name "amputation" is applied only in its basic, original value. The truncations of stump, produced for the purpose of prosthetics, are designated as re-amputation. Second-order interventions, undertaken from the vital readings, are named repeated amputations.

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As basic data for the following presentation served the deepened development of the histories of diseases/sicknesses/illnesses/maladies which were selected according to the sign of the presence of bullet break. By the same sign were determined the materials also of the second source - author's development of the histories of disease/sickness/illness/malady. The amputations, produced apropos of the injuries only of soft tissues, and also from all other readings, in this chapter, with a little exception, are not examined.

In exactly the same manner are excluded all amputations and ramifications of hand, foot and fingers/pins, independent of readings, on which these truncations were produced.

This special selection of the histories of the disease/sickness/illness/malady was reflected on all digital indicators and conclusions/derivations that it is necessary to keep in mind during their comparison with indicators and conclusions of other authors.

From table 295 it is evident that after fragmentation injuries the amputations were conducted almost 4 times more frequently than afterward bullet. Explosions and large/coarse fragments produced the more extensive decomposition of tissues, than bullet. Furthermore, after injuries with the large zone of damage more frequently were developed the heavy forms of wound infection.

Both these of factor became apparent with the injury of any part of the body. Therefore both upper and lower extremities they underwent amputations at all levels apropos of fragmentation injuries more frequently than apropos of bullet ones.

Of the data, given in Table 295, it is possible to draw one additional conclusion: with the fragmentation injuries more than the half amputations was conducted in order of primary surgical processing, whereas with the bullet injuries considerably

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predominated later amputations. This relationship/ratio is explained by the larger severity of the damages, plotted/applied by fragments.

With the bullet injuries the decomposition of tissues was less, which gave right during the primary processing to restrain from the amputation.



**Table 295. Frequency of amputations with the bullet and fragmentation breaks of the bones of extremities (in the percentages).**

(1) Вид ранения	(2) Время ампутации	(3) Локализация перелома				(8) В среднем
		(4) плечо	(5) пред- плечье	(6) бедро	(7) голень	
(9) Пулевое	(10) При первичной обработке	1,8	0,4	1,9	2,4	1,4
	В другое время . . (11) . . .	2,1	0,9	11,2	6,9	4,4
	(12) Итого . . .	3,9	1,3	13,1	9,3	5,8
Осколочное (13)	При первичной обработке (10)	11,5	8,0	5,3	14,9	0,5
	В другое время . . (11) . . .	6,0	3,5	16,9	11,9	9,7
	Итого (12) .	17,5	11,5	22,2	26,8	20,2
Всего . (14)	При первичной обработке (10)	6,0	2,8	3,4	9,5	5,3
	В другое время . . . . . (11)	3,8	1,7	13,7	9,6	6,6
	Итого (12) .	9,8	4,5	17,1	19,1	11,9
(15) В среднем . . . . .		5,6		18,3		

Key: (1). Means of injury. (2). Time of amputation. (3). Localization of break. (4). shoulder. (5). forearm. (6). thigh. (7). shin. (8). On the average. (9). Bullet. (10). During primary processing. (11). In another time. (12). Altogether (13). Fragmentation. (14). In all. (15). On the average.

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Table 296. Frequency of amputations in the various forms of the bullet breaks of the bones of different segments of extremities (on 100 injured people according to each form/species of break).

(1) Локализация перелома	(2) Время ампутации			
		(5) поко- ченный	(6) дырчатый	(7) попереч- ный
(14) Плечо	При первичной обработке (15) В другое время (14)	—	—	—
	Итого (17)	—	—	1,2
(18) Предплечье	При первичной обработке (15) В другое время (14)	—	—	—
	Итого (17)	—	—	0,6
(19) Бедро	При первичной обработке (15) В другое время (14)	—	—	—
	Итого (17)	5,4	3,2	8,3
(20) Голень	При первичной обработке (15) В другое время (14)	—	0,2	—
	Итого (17)	—	0,4	6,4
(21) В среднем	При первичной обработке (15) В другое время (14)	—	0,1	—
	Итого (17)	2,4	1,1	4,2
	Итого (17)	2,4	1,2	4,2

(3) Вид перелома						В среднем включая раненых, у которых вид перелома не был установлен
(2) продольный	(7) косой	(10) раздробленный	(11) крупнооскольный	(12) мелкооскольный	(13) краевой	
—	0,2	20,3	0,1	—	0,3	6,0
—	0,4	10,2	0,7	0,8	0,3	3,8
—	0,6	39,5	0,8	0,8	0,6	9,8
—	0,2	20,3	0,2	—	—	2,8
—	0,2	6,0	0,2	0,7	—	1,7
—	0,4	26,3	0,4	0,7	—	4,5
—	0,3	17,2	0,4	—	—	3,4
8,6	4,8	61,7	11,0	11,2	1,1	13,7
8,6	5,1	78,9	11,4	11,2	1,1	17,1
—	—	43,0	0,5	0,6	—	9,5
—	0,4	21,6	3,3	2,8	1,2	9,6
—	0,4	64,6	3,8	3,4	1,2	19,1
—	0,2	29,8	0,3	0,2	0,1	5,3
2,0	1,7	16,9	3,3	2,2	0,7	6,6
2,0	1,9	46,7	3,6	2,4	0,8	11,9

Key: (1). Localization of break. (2). Time of amputation. (3). Form/species of break. (4). On the average including injured people, whose form/species of break was not established/installed. (5). packed in. (6). Perforated. (7). cross. (8). longitudinal. (9). by scythe. (10). crushed. (11). large-splintered. (12). small-splintered. (13). edge/boundary. (14). Shoulder. (15). During primary processing. (16). In another time. (17). Altogether. (18). Forearm. (19). Thigh. (20). Shin. (21). On the average.

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During the solution of a question about the need for amputation important value had the form/species of break.

From table 296 it follows that the amputations were conducted most frequently with the crushed breaks. The second place in this respect belonged to fragmented breaks. With the remaining means of the bone damages to amputation they were conducted much more rarely.

These conclusions/derivations are completely regular. Breaking up and fragmented breaks of bones occur as a result of effecting/acting the most intense mechanical violence; during such damages of bones was usually observed the heavy decomposition also of soft tissues, which contributed to the development of the riskiest forms of wound infection.

Therefore with the crushed and fragmented breaks it was necessary to resort to the amputation by way of primary processing and subsequently more frequent than with other breaks.

The remaining numerals of table with more difficulty yield to analysis. Relative to amputations with the breaks of the bones of shin it is possible to give some supplementary information, namely:

with the bullet breaks of fibular bone the amputations are produced in 2.80/o of injured people, with the bullet breaks of the tibia - in 3.70/o and with breaks of both bones - in 48.60/o of injured people. These numerals are clear and explanations they do not require.

Surgical aid before the amputation.

Mechanical damage determined further fate of extremity only upon its complete destruction at one or the other level, i.e., with the breakaways and heaviest crushings. During all remaining damages the state of preservation of extremity, and frequently also the life of injured person depended on those measures which were undertaken after damage.

One of the main things among them was primary surgical processing. Therefore it is very important to explain, how many percentages of the injured people by it were subjected, under what conditions and as soon after injury was performed surgical processing, and also in what it consisted. The deepened development of the histories of disease/sickness/illness/malady makes it possible to answer these questions completely definitely.

From those those wounded the extremity with the damage to bone,

which subsequently produced amputation, to primary surgical processing it was subjected in average/mean 81.7o/o, namely: with the injuries of shoulder - 73.8o/o, forearms - 66.0o/o, thighs - 84.8o/o, shins - 83.9o/o.

Thus, surgical activity with the injuries in question was sufficiently high, but nevertheless their almost one fifth part remained without the primary surgical processing. As the basic reason for this should be recognized the complex conditions of combat circumstances.

The larger percentage of perfecting the injuries of lower extremities finds its explanation in surgeons' preferred attention precisely to these injuries as by that most threatened through the development of the risky forms of infectious complications compared with the injuries of upper extremities.

Data given in Table 297, as if they will not agree with the universally recognized opinion that the early primary processing, preventing many of the subsequent complications, thereby contributes to the retention/preservation/maintaining extremity. This alleged contradiction is explained by the fact that the reasons, which forced to produce amputations, in essence depended on the severity of injury itself as this shown above.

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From Table 298 it is evident that the overwhelming majority of injured people underwent primary surgical processing on DMP, then in the field mobile hospitals. To all remaining stages of sanitary evacuation fell only insignificant percentage of operations/processes. This position should be recognized correct.

On the character/nature of primary surgical processing with the bullet breaks of the bones of extremities it is possible to judge according to the data, given in Table 299. With it are connected the injured people, by which the amputation was produced not by way of primary processing.

Data, given in Table 299, they give to right make two following conclusions:

1. By the injured person to whom subsequently it was necessary to amputate extremity, by way of primary processing were conducted the more complex operations/processes: the carving of tissues, the dressing of vessels, the removal/distance of bone fragments, processing the fragments of bone and combination of enumerated interventions.

Table 297. Frequency of amputations with the bullet breaks of the bones of extremities in the dependence on the time of production in the primary surgical processing from the moment/torque of injury (in the percentages).

(1) Локализация перелома	(2) Время обработки в часах					
	1-5	6-11	12-24	(3) первые сутки без уточнения часа	(4) вторые сутки и позже	(5) обработки не было
Плечо . . . . . (6) . . .	14,8	11,2	11,2	14,0	13,5	3,3
Предплечье . . . . . (7) . . .	8,7	8,4	6,8	7,1	5,6	1,3
Бедро . . . . . (8) . . .	20,5	18,5	19,5	22,1	22,1	8,5
Голень . . . . . (9) . . .	28,8	24,3	20,3	28,6	20,8	6,3
В среднем . (10) . . .	18,1	15,8	15,0	17,7	15,9	3,8

Key: (1). Localization of break. (2). Time of processing in hours.  
 (3). first day without refinement of hour. (4). second day are later.  
 (5). processing it was not. (6). Shoulder. (7). Forearm. (8). Thigh.  
 (9). Shin. (10). On the average.



Table 298. Distribution of the amputated with the bullet breaks bones of extremities in the stages of primary surgical processing (in the percentages) .

(1) Локализация перелома	(2) Этапы, на которых производилась обработка				(3) Всего
	ДМП	ППГ	(4) армейские ЭГ и СЭГ	(5) прочие	
Плечо . . . . . (6) . . . .	79,8	13,4	2,2	4,6	100,0
Предплечье . . . . . (7) . . . .	82,3	12,6	2,4	2,7	100,0
Бедро . . . . . (8) . . . .	76,7	19,9	2,0	1,4	100,0
Голень . . . . . (9) . . . .	78,4	17,0	2,4	2,2	100,0
В среднем у лиц, подвергавшихся ампутации . . . . . (10) . . . .	78,8	16,6	2,2	2,4	100,0
В среднем у лиц, не подвергавшихся ампутации . . . . . (11) . . . .	76,8	17,0	2,3	3,9	100,0

Key: (1). Localization of break. (2). Stages, in which was performed processing. (3). In all. (4). army EG and SEG. (5). other. (6). Shoulder. (7). Forearm. (8). Thigh. (9). Shin. (10). On the average in those, who were undergoing amputation. (11). On the average in those, who were not undergoing amputation.

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Table 299. Distribution of the injured, undergoing and not undergoing amputation with the bullet break bones of extremities according to the means of primary surgical processing (in the percentages).

(1) Локализация перелома	(2) Группа раненых	(3) Содержание первичной хирургической обработки						
		(4) рас- сече- ние	(5) рассече- ние и иссече- ние	(6) рассечение и иссечение				(7) прочие виды первич- ной хи- рургиче- ской обработ- ки
				(11) с пере- ткнутой сосудом	(12) с удале- нием повреж- денных тел	(13) с удале- нием костных осколков	(14) с обра- боткой фрагмен- тов кости	
Плечо (15)	Подвергавшиеся ам- путации (16) . .	32,6	16,3	14,7	2,3	30,2	1,6	—
	Не подвергавшиеся ампутации (17) .	51,8	14,3	1,6	6,5	22,6	1,0	0,2
Предплечье (18)	Подвергавшиеся ам- путации (16) . .	27,6	19,1	13,8	3,2	29,9	1,1	1,1
	Не подвергавшиеся ампутации (17) .	58,2	12,9	4,7	4,9	17,4	0,6	0,2
Бедро (19)	Подвергавшиеся ам- путации (16) . .	40,7	14,3	4,7	7,5	25,2	1,9	1,0
	Не подвергавшиеся ампутации (17) .	54,7	13,9	1,3	8,3	17,9	1,0	0,5
Голень (20)	Подвергавшиеся ам- путации (16) . .	42,6	13,6	10,4	3,1	23,9	0,4	0,4
	Не подвергавшиеся ампутации (17) .	55,9	13,0	3,5	6,3	18,4	0,5	0,3
В среднем (21)	Подвергавшиеся ам- путации (16) . .	39,9	14,5	8,6	4,9	25,4	1,2	0,7
	Не подвергавшиеся ампутации (17) .	55,4	13,5	3,0	6,4	18,8	0,7	0,3

(5) сочетание из ука- занных элемен- тов	(9) Итого	(10) Обра- ботки не было
2,3	100,0	26,2
2,0	100,0	32,3
4,2	100,0	34,0
1,1	100,0	46,0
4,7	100,0	15,1
2,4	100,0	27,0
5,6	100,0	14,7
2,1	100,0	28,3
4,8	100,0	18,3
1,9	100,0	25,3

Key: (1). Localization of break. (2). Group of injured people. (3). Content of primary surgical processing. (4). dissection. (5). dissection and carving. (6). dissection and carving. (7). other means of primary surgical processing. (8). combination of elements/cells indicated. (9). altogether. (10). Processings it was not. (11). with dressing of vessels. (12). with removal/distance of foreign bodies. (13). with the removal/distance of bone fragments. (14). with processing of fragments of bone. (15). Shoulder. (16). Undergoing amputations. (17). Not undergoing amputations. (18). Forearm. (19).

Thigh. (20). shin. (21). On the average.

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In other words, in these injured people primary processing was more radical; the simplest form of processing - dissection of tissues - it was applied more rarely (39.90/o).

In those injured people whose damaged extremity it was possible to preserve, predominated (55.40/o) the simplest form of processing, and more radical interventions were conducted more rarely. These relationships/ratios were observed with the regular constancy with the breaks of the long bones both of upper and lower extremity.

2. Among injured people with preserved extremity percentage of those remaining without surgical processing almost is twice more than among those, to which subsequently it was necessary to amputate extremity.

To explain these two facts is possible as follows: the character/nature of primary surgical processing, other conditions being equal, was determined by the severity of injury. From it in many respects depended the subsequent complications, first of all the riskiest forms of wound infection.

During the extensive damages it was necessary to perform processing radically; with more than the lungs - it was possible to be restricted only to the dissection of tissues; under the unfavorable for the surgical measures conditions by the most easily injured person of any surgical processing she was in no way conducted.

Therefore the treatment of the radically processed bullet breaks as heaviest subsequently was more frequently finished with amputation.

Table 300. Frequency of amputations with the bullet breaks of the bones of extremities during the different years of war (in the percentages).

(1) Локализация перелома	(2) Время ампутации	(3) Годы					(4) В сред- нем
		1941	1942	1943	1944	1945	
Плечо (5)	При первичной обработке (6)	3,9	4,5	6,7	5,8	9,4	6,0
	В другое время . . . (7)	2,3	3,4	4,3	4,1	3,9	3,8
	Итого . (8)	6,2	7,9	11,0	9,9	13,3	9,8
Предплечье (9)	При первичной обработке (6)	1,5	1,9	3,8	3,6	2,5	2,8
	В другое время . . . (7)	1,5	1,6	2,1	1,4	2,3	1,7
	Итого . (8)	3,0	3,5	5,9	5,0	4,8	4,5
Бедро (10)	При первичной обработке (6)	1,2	2,6	2,7	4,7	5,7	3,4
	В другое время . . . (7)	7,0	11,5	14,2	14,6	18,9	13,7
	Итого . (8)	8,2	14,1	16,9	19,3	24,6	17,1
Голень (11)	При первичной обработке (6)	5,3	7,1	9,1	12,2	12,0	9,5
	В другое время . . . (7)	7,6	10,3	9,3	9,8	9,7	9,6
	Итого . (8)	12,9	17,4	18,4	22,0	21,7	19,1
В среднем (12)	При первичной обработке (6)	2,7	3,8	5,6	6,8	7,5	5,3
	В другое время . . . (7)	3,9	6,0	7,0	7,2	8,6	6,6
	Итого . (8)	6,6	9,8	12,6	14,0	16,1	11,9

Key: (1). Localization of break. (2). Time of amputation. (3). Years. (4). On the average. (5). Shoulder. (6). During primary processing. (7). In another time. (8). Altogether. (9). Forearms. (10). Thigh. (11). Shin. (12). On the average.

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The injuries whose primary perfecting consisted only in the dissection of tissues, were more favorable and therefore they were

more rarely accompanied by amputation. Understandable also which with the lightest injuries, left without the surgical processing, extremity was possible to preserve more frequently.

Data of the deepened development of the histories of diseases/sicknesses/illnesses/maladies, given in chapter about the primary processing (T. of 15 present works, pg. 157), attest to the fact that with the course of the Great Patriotic War the percentage of the unfinished injuries sharply was decreased, and the radicality of primary processing considerably grew/rose.

At the same time, the frequency of amputations with the bullet breaks all grew/rose, that it is possible to see from the data, given in Table 300.

Table 300 shows that during the Great Patriotic War the frequency of amputations continuously grew/rose, after achieving into 1945 more than twofold increase in comparison with 1941. The frequency increase of amputations occurred with the bullet breaks both of upper and lower extremity, independent of level and time of the production of amputations.

The increase of the frequency of amputations on the years of war is explained by many factors; some of them should be recognized as